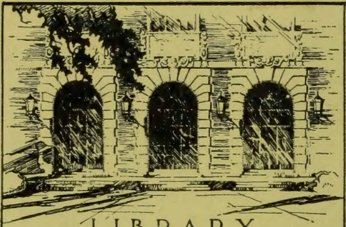

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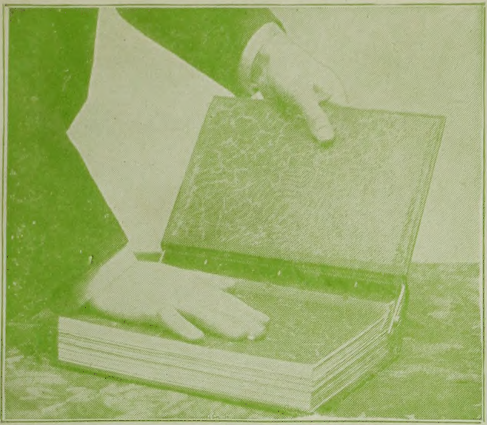

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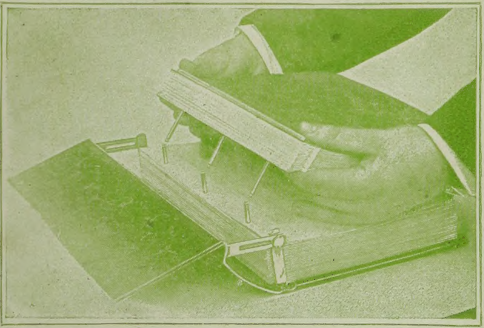

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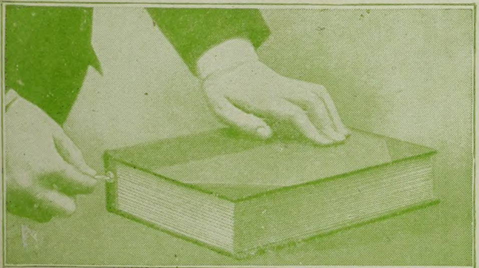

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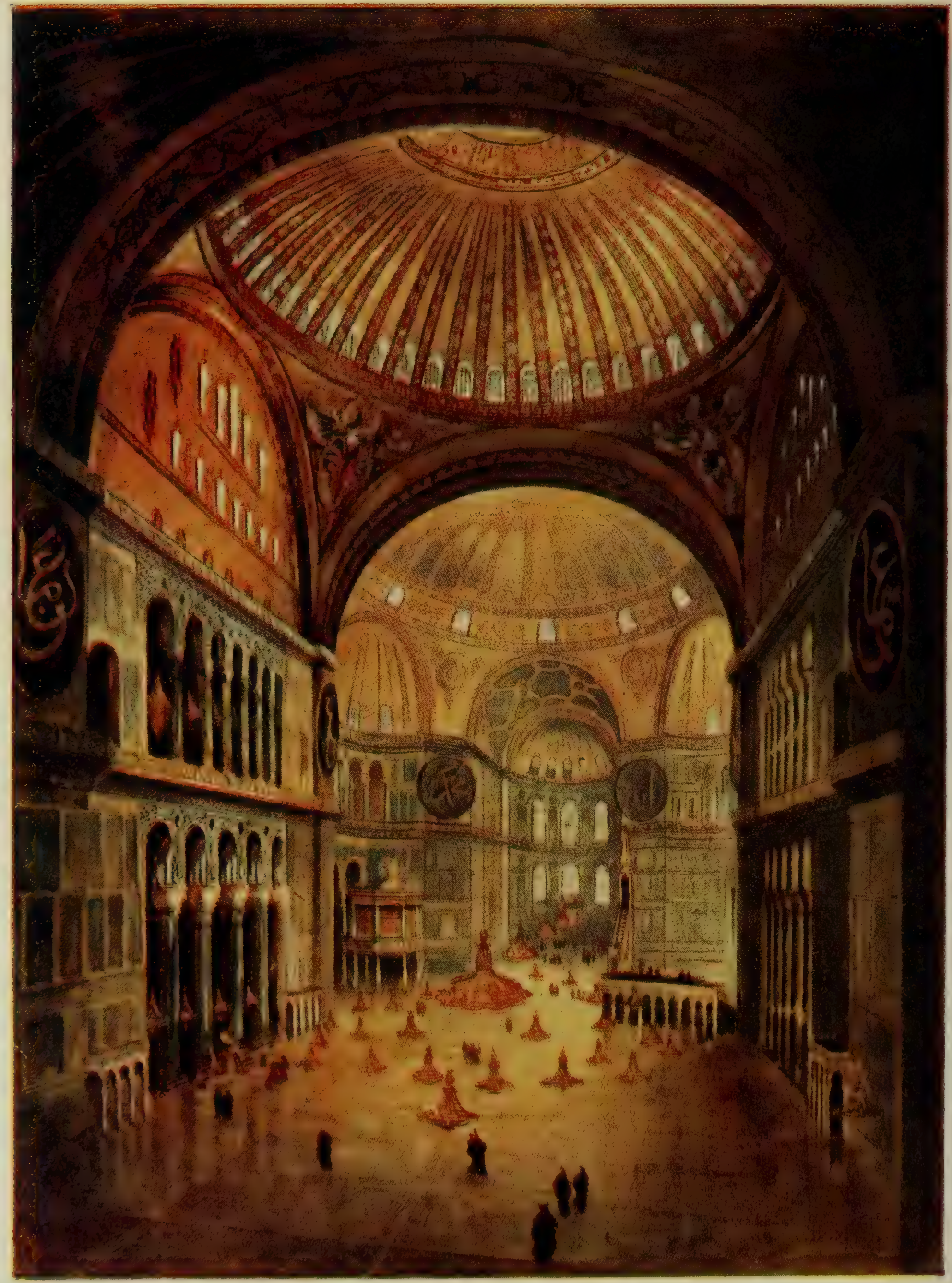

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The Mosque of St. Sophia, Constantinople (Interior).

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V. 2

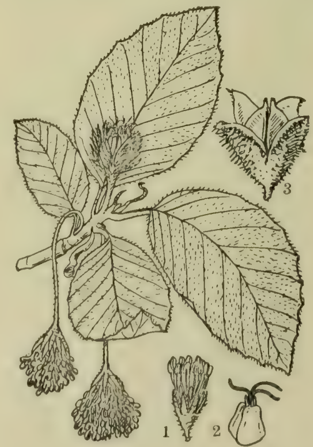
LIST OF CONTRACTIONS USED IN THIS WORK.

ac., acres.
agric., agricultural.
Ala., Alabama.
alt., altitude.
Alta., Alberta.
Amer., America or American.
anc., ancient.
ann., annual.
Ar., Arabic.
Aram., Aramaic.
Ariz., Arizona.
Ark., Arkansas.
arr., arrondissement.
A. S., Anglo-Saxon.
A. V., Authorized Version.
aver., average.
b. p., boiling point.
bor., borough.
Brit., Britain or British.
B. C., British Columbia.
bur., burgh.
c. (circa), about.
C., centigrade.
Cal., California.
cap., capital.
cf., compare.
co., county.
Colo., Colorado.
Com., Commission.
comm., commune.
Conn., Connecticut.
cub. ft., cubic feet.
Dan., Danish.
D. C., District of Columbia.
Del., Delaware.
dep., department.
dist., district.
div., division.
Du., Dutch.
E., east.
eccles., ecclesiastical.
ed., edition; edited.
e. g., for example.
Eng., England or English.
episc., episcopal.
et. seq., and the following.
F., Fahrenheit.
Fla., Florida.
fort. tn., fortified town.
Fr., French.
ft., feet.
Ga., Georgia.
Ger., German.
gov., government.
Gr., Greek.
Heb., Hebrew.
I., **isl.**, island.
Ia., Iowa.
ibid., the same.
i. e., that is
Ill., Illinois.
in., inches.
Ind. T., Indian Territory.
Ind., Indiana.
Ire., Ireland or Irish.
Ital., Italian.
Kan., Kansas.
Ky., Kentucky.
l., lake.
La., Louisiana.
Lat., Latin.
lat., latitude.
l. bk., left bank.
lit., literally.
long., longitude.
m., miles.
Man., Manitoba.
Mass., Massachusetts.
Md., Maryland.
Me., Maine.
M. E., Methodist Episcopal.
Meth., Methodist.
Mich., Michigan.
Minn., Minnesota.
Miss., Mississippi.
Mo., Missouri.
Mont., Montana.
m. p., melting point.
mrkt. tn., market-town.
Mt., **mts.**, mount, mountain, -s.
munic., municipal.
N., north.
Neb., Nebraska.
N. B., New Brunswick.
N. C., North Carolina.
N. Dak., North Dakota.
Nev., Nevada.
N. H., New Hampshire.
N. J., New Jersey.
N. Mex., New Mexico.
N. S., Nova Scotia.
N. T., New Testament.
N. W. T., Northwest Territories.
N. Y., New York.
O., Ohio.
Okla., Oklahoma.
Ont., Ontario.
Ore., Oregon.
O. T., Old Testament.
par., parish.
parl., parliamentary.
Pa., Pennsylvania.
P. E., Protestant Episcopal.
P. E. I., Prince Edward Island.
Per., Persian.
P. I., Philippine Islands.
pop., population.
Port., Portuguese.
P. R., Puerto Rico.
Presb., Presbyterian.
prom., promontory.
prov., province.
pueb., pueblo.
Que., Quebec.
q. v., which see.
R., **riv.**, river.
r. bk., right bank.
R. C., Roman Catholic.
R. R., or **ry.**, railroad or railway.
R. I., Rhode Island.
R. V., Revised Version.
R. R. jn., railroad junction.
S., south.
Sans., Sanskrit.
Sask., Saskatchewan.
S. C., South Carolina.
Scot., Scotland or Scottish.
S. Dak., South Dakota.
seapt., seaport.
Sp., Spanish.
sp. gr., specific gravity.
sq. m., square miles.
stn., station.
s. v., under the word.
Syr., Syriac.
temp., temperature.
Tenn., Tennessee.
terr., territory.
Tex., Texas.
tn., town.
trans., translated.
trib., tributary.
U. S., United States of America.
Va., Virginia.
vil., village.
vol., volume.
Vt., Vermont.
W., west.
Wash., Washington.
wat.-pl., watering-place.
W. Va., West Virginia.
Wis., Wisconsin.
Wyo., Wyoming.
yds., yards.

and often in conspicuous clusters. The stems are four-angled, generally climbing or trailing. Yellow or lady's bedstraw (*G. verhum*) was formerly used for curdling milk; and a yellow dye was obtained from the flowers by boiling them in an alum solution. A red color is also got from the roots. Cleavers, or goose-grass (*G. aparine*), is the rough trailing herb, climbing in bushes by means of minute hooked hairs. Its spherical fruits, roasted and ground, are said (doubtedly) to be an excellent substitute for coffee.

Cut-leaved Beech (*Fagus laciniata*), *a variety of cultivated Beech.*
(*Photo. by G. Chase, Newport, R.I.*)

Beech. The American beech (*Fagus Americana*) is one of the stateliest of our forest trees. It is large, attaining to a height of more than 100 ft., and a diameter of 4 ft., and when grown in the open forms a very symmetrical head, a wide-spreading pyramid or dome. The light-gray, smooth bark is conspicuous in winter; as are also the fine sprays, and the long, sharp pointed buds. In summer the dull, acuminate leaves give deep shade. In autumn the leaves take on glowing yellow, orange, gold and purple tints. The male and female flowers occur on the same tree. The former consist of little bunches of yellow pendent catkins, each catkin including ten or more flowers; the female flowers are enclosed within a mass of scales, which developes into the prickly husks that ultimately ripen and burst open in four valves, liberating the two triangular nuts within. The beech is easily propagated by sowing the nuts in March at a depth of one inch in carefully prepared soil.



Beech.
1, Male flower: 2, female flower; 3, fruit.

The European beech (*F. sylvatica*) is also famous. It was honored by the Romans, and is the Danish national tree. The old herbalist, Gerard, referred to beechnuts as fattening food for swine and deer, as 'pleasant' to thrushes and pigeons, and as 'greatly delighting mice and squirrels.' They have also been dried and made into flour, and have been used as a source of oil. There are many varieties of this beech in cultivation. Of these the copper beech and purple beech are best known. Both these are very beautiful when the leaves are expanding in the spring, but become dull and monotonous as the color deepens with advancing summer. The weeping beech (*F. s. pendula*) and the fern-leaved beech (*F. s. aspelinifolia*) have their admirers.

Beecher, CATHERINE ESTHER (1800–78), American educator, eldest child of Lyman Beecher, was born at East Hampton, L. I., N. Y., and was educated at the seminary at Litchfield, Conn. The loss of Prof. Fisher of Yale at sea, to whom she was betrothed, led her to devote her life to teaching. She established a school for young women at Hartford, Conn., which became very successful and was continued for ten years after her father's acceptance of the presidency of Lane Theological Seminary (1832). She accompanied him to the West, and there developed an extensive plan for introducing women teachers into that part of the country, which was successful, except as it was neutralized by their early marriage. She published several books on domestic and educational subjects, of which the most important was written in collaboration with her sister, Harriet Beecher Stowe, *The American Woman's Home* (1869).

Beecher, CHARLES (1815–1900), American clergyman, fourth son of Lyman Beecher, was born at Litchfield, Conn., and graduated (1834) at Bowdoin. He studied divinity at Lane Theological Seminary. He was ordained pastor of the Second Presbyterian Church of Fort Wayne, Ind., 1844, and held pastorates over Congregational churches in N. J., Mass., and Penn. He was state superintendent of public instruction for Florida for two years during his residence in that state (1870–7). Mr. Beecher made the musical selections for the *Plymouth Collection of Hymns and Tunes.* He edited the *Autobiography and Correspondence of Lyman Beecher* (1864), and wrote *Pen Pictures of the Bible* (1855), *Spiritual Manifestations* (1879), and *Eden Tableau* (1880).

Beecher, CHARLES EMERSON (1856–1904), American geologist, was born at Dunkirk, N. Y., and graduated (1878) at the University of Michigan. He was for ten years an assistant in the New York State Museum and upon the State Geological Survey. In 1888 he was appointed to the Yale teaching staff, and in 1897 became professor of historical geology at that university. Two years later he was in addition appointed curator of the geological collection. Professor Beecher contributed more than fifty papers to scientific periodical literature. They dealt principally with brachiopoda and trilobita.

Beecher, EDWARD (1803–95), American clergyman and educator, second son of Lyman Beecher, was born at East Hampton, L. I., N. Y., and graduated (1822) at Yale. He studied for the ministry at Andover and at Yale, where he was a tutor until 1826, when he assumed charge of the Park Street Congregational Church, Boston, Mass. From 1830 to 1844 he was president of Illinois College, at Jacksonville, Ill,. and was helpful in the pioneer development of the West. Dr. Beecher was pastor of churches in Boston and in Galesburg, Ill., from 1844 to his retirement in 1872. He was an editor of the *Congregationalist*, and wrote for other periodicals. His principal works, *The Conflict of Ages* (1853) and *The Concord of Ages* (1860), promulgate the theory that man's life upon earth is the outgrowth of a former life as well as the prelude to a future one.

American Beech (*Fagus Americana*) *in Winter.*

Beecher, HENRY WARD (1813–87), American clergyman, third son of Lyman Beecher and brother of Harriet Beecher Stowe, was born at Litchfield, Conn., and graduated (1834) at Amherst. He studied divinity at the Lane Theological Seminary, near Cincinnati, O., of which his father was president, and his first pastorate was that over the Presbyterian Church at Lawrenceburg, Ind., 1837, when he married Eunice White Bullard. From 1839 to 1847 he preached at Indianapolis, in the latter year accepting a call to the pastorate of Plymouth Congregational Church, Brooklyn, N. Y. Here he gathered around him the largest congregation in the U. S. From the first Mr. Beecher took a great interest in public questions, identifying himself with the anti-slavery party, and making bold attacks on intemperance and political abuses. His sermons were marked by great freshness, originality, eloquence, and imagination. They were printed weekly, beginning with 1859, in a publication entitled *Plymouth*

Pulpit. He gained a great reputation as a speaker on public occasions and lecturer, his lecture engagements becoming so numerous that he was compelled temporarily to abandon the field. His efforts in favor of the abolition of slavery were untiring; he took an active part in the Republican campaign of 1856, and in 1863 he delivered in England a course of remarkable addresses which had a considerable influence in changing public opinion in that country in favor of the Union cause. They were published in London as *Speeches on the American Rebellion* (1864). Mr. Beecher was editor of the *Independent*, 1861–3, and contributed to it for twenty years. Some of his contributions, signed with an asterisk, were published as *Star Papers* (1855–8). He was editor of the *Christian Union* (now the *Outlook*) in 1870–1881. In 1874 Mr. Beecher's reputation was temporarily beclouded by a suit brought by Theodore Tilton for alienating his wife's affections. Leading counsel were employed on both sides, and the trial, which lasted six months, ended in a disagreement of the jury, nine of whom voted for Mr. Beecher's innocence. The largest Congregational council ever convened, after a thorough examination of the charges, proclaimed his innocence. At a celebration of Mr. Beecher's seventieth birthday, by the citizens of Brooklyn, the same opinion was expressed in a formal resolution. Justice Neilson, who presided at the trial, also presided at this celebration, and the chief counsel for Mr. Tilton, several years after the trial, publicly expressed his belief in Mr. Beecher's innocence. In 1882 he withdrew from the local association of Congregational churches, owing to criticism of his theological views. He again visited England in 1886, and died the following year. See Lyman Abbott's *Henry Ward Beecher*, with a full bibliography (1903); and *Henry Ward Beecher: a Biography*, by W. C. Beecher, Rev. S. Scoville, and Mrs. Beecher (1888).

Beecher, Lyman (1775–1863), American clergyman, was born in New Haven, Conn., and graduated (1797) at Yale. He pursued his theological studies at New Haven, was licensed to preach, 1798, and was ordained pastor of the Presbyterian church at East Hampton, L. I. 1799. He was called to the Congregational church at Litchfield, Conn., 1810. The defection among Congregational churches caused by Dr. Channing's propaganda led Dr. Beecher to accept a call to the Hanover Street church in Boston, 1826, where he upheld the Trinitarian side of the controversy until his acceptance, 1832, of the presidency of Lane Theological Seminary, near Cincinnati, O., a position which he held for twenty years. The last ten years of his life were passed, his health failing, at the home of his most distinguished son, Henry Ward Beecher, in Brooklyn, N. Y. He published an edition of his *Works* (3 vols., 1852). His highly entertaining *Autobiography and Correspondence* was edited by Charles Beecher (1863).

Beecher, Thomas Kennicutt (1824–1900), American clergyman, sixth son of Lyman Beecher, was born at Litchfield, Conn., and graduated (1843) at Illinois College. After several years of teaching he became pastor (1852) of the N. E. Congregational church at Williamsburg, N. Y. In 1854 he removed to Elmira, N. Y., and was pastor of the Independent church (later Park church) until his death. Mr. Beecher introduced many institutional features into his church organization, such as a bowling alley, stage, gymnasium, and parlors, and gave personal attention to their development, as well as spending the greater part of his salary in charities personally distributed. He was nominated against his will for many political offices, but always by a minority party. Among the poorer classes he was known as 'Father Tom.' Author of *Our Seven Churches* (1870).

Beechey, Frederick William (1796–1856), English rear-admiral and geographer, son of Sir William Beechey, served under Franklin in the Arctic expedition of 1818, and under Parry in 1819. He co-operated, by Bering Strait, with polar expeditions from the east (1825), and at various periods was employed in survey work on the north coast of Africa, the coast of S. America, and the Irish seaboard. Author of various geographical works, including a *Voyage of Discovery towards the N. Pole* (1843), and an account of his Bering Strait explorations (1831).

Beechey, Sir William (1753–1839), English painter, entered as student at the Royal Academy (1772). Elected A.R.A. in 1783, his portrait of Queen Charlotte, painted the same year, procured him the post of portrait painter to her majesty. In 1798 he was knighted and elected R.A. His reputation depends on his portraits, which are marked by good coloring, but by stiff and ill-arranged draperies. Two examples of his portraits are in the Metropolitan Museum of Art, New York.

Beechey Island, islet, Arctic Archipelago, N. of Barrow Str., Canada, 74° 43′ N., 91° 39′ W.; so called from Admiral Beechey. Here Franklin's second expedition wintered for two years, and here memorials have been erected to the members of this and of a later British expedition, also to Lieutenant Bellot, who perished in 1853.

Bee-eater, a bird of the picarian family Meropidæ, allied to the kingfishers. All the bee-eaters are brilliantly colored, green predominating, with long bills and great power of flight; the majority are Ethiopian forms. The common migratory bee-eater of Europe (*M. apiaster*) has an extensive range over Asia, Europe, and Africa, and earns its name by its habits, but all the members of the family subsist on insects caught during flight. They breed in deep holes excavated in river banks and lay unspotted eggs.

Bee-eater.

Beefeater. (1.) A term popularly applied to some of the retinue of the English royal household, notably to the yeomen of the guard, whose original duties were those of service at the king's table. The word has been derived from the corrupted French *beaufetier*, or *buffetier*, one who waits at the buffet or sideboard. Skeat, however, maintains that its natural English meaning is the right one. See Yeomen of the Guard. (2.) An African bird (*Buphaga africana*) similar to the starling, called also ox-pecker and buffalo-bird. It is seen in small flocks, alighting on the backs of cattle and other animals, where it searches for and picks from their hide the larvæ of botflies, on which it feeds.

Beefsteak Club, a social club founded (1735) by Rich and Lambert, actors, at Covent Garden Theatre, in the reign of Queen Anne, and known as the Sublime Society of Steaks. The Prince of Wales was a member, as also were Garrick, Beard the singer, Hogarth, and Wilkes, and Charles Morris was club laureate. It was dissolved in 1867. See Arnold's *Life....of the Sublime Society of Steaks* (1871). Another club of this name, of which Peg Woffington was first president, was connected with the Theatre-Royal, Dublin, and was founded by Sheridan in 1749. There is also a modern Beefsteak Club in Lon don, founded in 1876, and long associated with Toole's Theatre.

Beef Tea, a light article of diet, commonly used for the sick and convalescent. It is best prepared as follows: Take a pound of lean beef, free from tendon, fat, etc.; chop fine, and let it lie in a pint of cold water for two hours. Simmer for three hours at a temperature never over 160° F. Make up the water lost with cold water, so that a pint of the tea represents a pound of beef. Strain, and carefully express all fluid from the beef. The composition of well made beef tea is—water, 96.31; albuminoids, 0.82; extractives 2.09; salts, 0.78 per cent. Even the best beef tea is practically no more than a stimulating drink, containing a minimum of nourishment. It is, however, useful for that very reason, when invalids are more in need of rest for the stomach then of food, as is often the case. It must never be used to replace nutriment where that is needed. Numerous beef extracts, from which beef tea may be expeditiously prepared, are on the market.

Beefwood, a name applied to the wood of two different kinds of tree—the bully-tree (*Swartzia*) of the order Leguminosæ, in Guiana, and the various species of *Casuarina*, found in Australia. See Casuarina.

Beelzebub, bē-el'zi-bub, or, as in 2 Kings i.2 *ff*, Baalzebub, 'Baal of flies,' *i. e.* a god who controls insect plagues (*cf.* Zeus Apomuios of the Greeks—Pausanias, viii. 26, 7), a deity whose shrine was at Ekron, a Philistine town. As the later Jews considered heathen gods to be demons, the New Testament transference of the name (which, according to the best mss., should be Beelzebul) to Satan is easily understood. The word is now believed to be a derisive corruption of Baalzebul, 'lord of the high house'—*i. e.*, the deity worshipped in a temple—and Matt. x.25 seems to hint at the original meaning, the 'high house' being now 'the pit.' See Baal.

Bee Martin. See King Bird.

Bee Moth. See Honey Moth.

Beer. See Brewing.

Beer'bohm, Max (1872), British author and caricaturist, a half-brother of Sir Beerbohm Tree (q. v.), was born in London. He was educated at Oxford, and early attracted attention by his skilful caricatures of contemporary figures. He published *The Works of Max Beerbohm; More; Yet Again; A Christmas Garland; The Happy Hypocrite; Zuleika Dobson,* his only novel, a burlesque of student life at Oxford; *Caricatures of Twenty-Five Gentlemen; The Poets' Corner; A Book of Caricatures; The Second Childhood of John Bull; Fifty Caricatures.* A number of exhibitions of his drawings have been held.

Beernaert, bâr'närt, Auguste Marie François (1829–1912), Belgian statesman, was born in Ostend. He was educated at the University of Louvain and commenced the practice of law in Brussels in 1853. From 1873 to 1878 he was minister of public works; in 1884 he was appointed minister of agriculture, industry, and public works, and soon after he became president of the council and minister of finance. He was made minister of state in 1894. M. Beernaert was an ardent advocate of international arbitration and served many times on arbitral tribunals.

Beeroth, bē'rōth, a city of Benjamin (Josh. xviii. 25, etc.), between Jerusalem and Bethel; now the village Bireh, on the main north road. It contains the ruins of two ancient reservoirs and of a Christian church erected by the Templars in 1146. Pop. 1,000.

Beers, Henry Augustin (1847), American educator, was born in Buffalo, N. Y., of a Connecticut family. He was graduated (1869) from Yale, studied law and practised for a year in New York, after which he joined the Yale teaching staff (1871). He was appointed assistant professor of English in 1875, and full professor in 1880. He contributed extensively to periodicals, and was a member of the staffs of several dictionaries and encyclopædias. His own books include: *Odds and Ends,* verse (1878); *A Century of American Literature* (1878); *Life of Nathaniel Parker Willis* (1885); *The Thankless Muse,* verse (1885); *From Chaucer to Tennyson* (1890); *Initial Studies in American Letters* (1891); *Selections from the Prose Writings of S. T. Coleridge* (1893); *The Ways of Yale,* sketches (1895); *History of Romanticism in the Eighteenth and Nineteenth Centuries* (1899-1901); *Points at Issue* (1904); *Milton's Ter-Centenary* (1910); *The Two Twilights,* verse (1917); *Four Americans: Roosevelt, Hawthorne, Emerson, Whitman* (1919).

Beersheba, bē'er-shē'ba, town, Palestine, the southernmost one belonging to the Israelites (whence came the saying 'from Dan to Beersheba,' meaning all Israel), lies 40 miles southwest of Jerusalem. It seems to have derived its name, signifying 'well of swearing' or 'well of seven,' from the covenant entered into here by Abraham and the Philistine Abimilech, which Abraham ratified by an oath and a gift of seven ewe lambs (Gen. xxi. 28, 32). It is closely associated with the history of the patriarchs, and frequent references are made to it throughout the Old Testament narrative. In the days of Eusebius (264-340) Beersheba was a flourishing market-village with a Roman garrison, and also an episcopal see. Extensive ruins now mark its site. A little to the southwest is the modern town, Bir-el-Seba, with a serai, a mosque, and a few small shops.

During the course of the Great War of Europe (q. v.) British and Australian troops under General Allenby occupied Beersheba Oct. 31, 1917.

Bees, a family of insects belonging to the order Hymenoptera (q. v.), and to the same sub-order as the wasps and ants (qq. v.) from which they differ by the possession of more profuse branched and feathery hairs on the head and thorax and by the modification of the mouth parts into a proboscis-like structure, fitted in many varieties for gathering nectar from deep tubular blossoms.

Bees are variously classified on the basis of structural differences and on the basis of habit. Structurally there are two great groups—those in which the tongue is a short, flattened, spoon-like organ, and those in which it is long, slender, and flexible. Grouped on the basis of habit, they also fall into two classes, solitary and social.

Solitary bees include the so-called Mining Bees of the short-tongued genera Colletes and Prosopis, which burrow in the ground or in stems of brambles and other plants; the large and small Carpenter Bees, which tunnel their way into twigs and canes and even into fallen trees, fence posts, and boards (see Carpenter Bee); the Mason Bees, which build their nests of clay or sand; the Potter Bees; the Leaf-cutting Bees; and other varieties. Many solitary bees, especially the Nomadidæ, or Cuckoo Bees, and the Stelidæ, are parasitic in character, the female depositing eggs in the nest burrow of another bee, upon whose food supplies the newly hatched larvæ may feed.

The social bees include two great families—the Honey Bees (*Apidæ*) and the Bumble Bees (*Bombidæ*). These bees live in communities, and, as in the case of ants, various sets of members have come to discharge special functions. The result of this division of labor has been difference of form, or polymorphism. In fact, restricted function has led to the establishment of castes. Thus the ordinary hive contains (1) a single queen bee—

the fertile female and mother of the next brood, (2) the males or drones, and (3) the vast majority of workers or imperfectly developed females, which only exceptionally become fertile. Because of its great economic importance, the Common Honey Bee or Hive Bee will be considered in detail.

Form and Structure.—Like that of other insects, the body of the bee is readily divisible into three portions—head, thorax, and abdomen. The *head* is well defined from the body, and bears the organs of sight, touch, mastication, and honey-collecting. There are two compound *eyes*, borne on the sides of the head. Below the eyes are two jointed feelers or antennæ, most essential organs of sensation. Next come the horny, toothed mandibles, freely articulated to the head, and well adapted for cutting the resinous cement or propolis into shapes, and for the finer work of handling the pollen, and the like. The *first pair of maxillæ* are much elongated flattened blades, embracing the second pair, and forming the outer sheath of the proboscis, as the entire collecting organ is called. The fused basal portion of the *second pair of maxillæ*, the *mentum*, as it is called, is in movable membranous and elastic connection with the cardines or bases of the first pair.

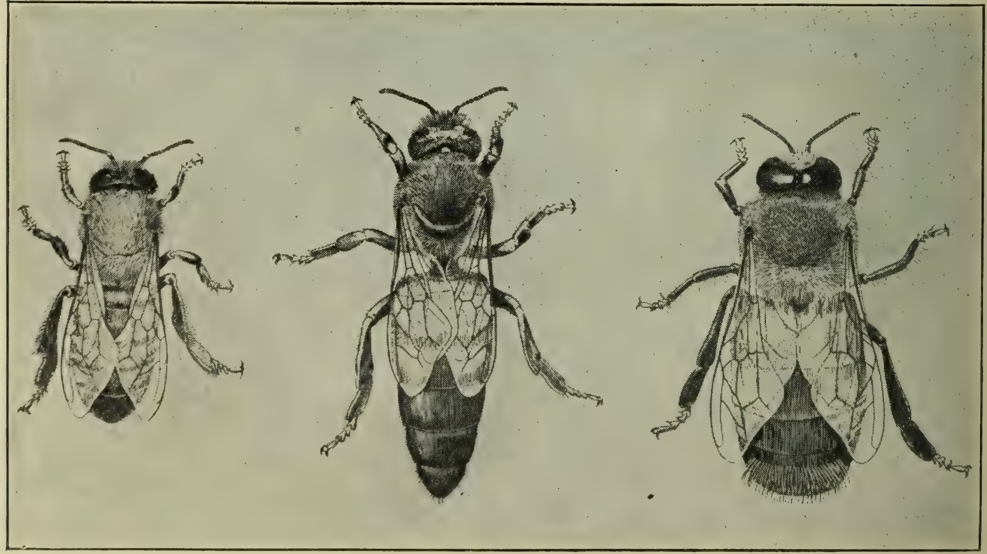
This mentum bears internally the structure known as the *ligula* or *tongue*. In the long-tongued bees, to which both the honey bee and bumble bee belong, this is a much elongated slender hairy organ of varying firmness throughout its course. When at rest, the internal portion of the tongue is somewhat curled up and retracted into the lower end of the mentum. It is capable of very rapid protrusion and of free motion in almost every direction. The tongue of the workers is twice as long as that of the queens or the drones, who do not collect honey.

The somewhat oval *thorax* bears the two pairs of wings and three pairs of legs, and consists of the usual three segments, of which the most anterior (the prothorax) is greatly reduced. The wings, which are borne on the last two segments, are membranous and transparent. When at rest, they are folded together over the back; when in action the two pairs are clasped together by means of small hooks on the fore margin of the hind pair. The many-jointed mobile legs do not differ from those of other insects, except in the high development of pollen-collecting hairs.

The *abdomen*, or posterior portion of the body, is joined to the thorax by a comparatively narrow bridge. The females bear at the end of the body an ovipositor or sting, which consists of a median piece deeply grooved on its lower surface and of two adjacent sharply pointed structures, which being apposed to the median piece make the groove into a canal. The internal end of the canal thus formed is in connection with the female generative aperture, so that the eggs can pass neatly down from the body of the bee into the cell prepared as a cradle. But the base is also connected with a poison-bag containing formic acid and other irritants, which are squeezed into the wound made by the sharp sting, and are the obvious causes of the familiar inflammation. In the queen bees this specialization of abdominal appendages forms a long, stout, curved organ, which is occasionally used as a weapon in duels with rivals, but much more frequently for its main business as an egg-laying organ.

The circulatory, respiratory, excretory, and reproductive systems do not differ markedly from those of other insects.

Life History.—As in the case of the majority of insects, the life-history is divisible into four chapters—the developing egg, the larva or grub, the pupa, and the perfect insect. (1) The *eggs* have a long oval shape, and a whitish color. They are laid by the queen bee. After normal fertilization she becomes, in fact, little more than an egg-producing machine, turning them out sometimes at the rate of 100 per hour, and is often fed while at her work, so that the expenditure of living matter is to a certain extent recouped. If a young queen be not impregnated in the first three weeks of her life, she continues laying drone-eggs only, as above described. (2) The



Photograph from Underwood and Underwood, N. Y.

The Honey Bee

From left to right, worker, queen, drone *grub* appears after three or four days, and grows like any other insect larva, and as it touches the sides of its cell, coils up in a crescent, and floats in the food which has been left in the cell. During this stage the reproductive organs either atrophy, as in the case of the worker grubs, or fully develop, as in the queen type. (3) In several days, varying slightly with the season, the grub passes into another stage of its life history. It has grown greatly and accumulated some reserve material to serve it throughout a period of fasting. The cell is sealed up by the nurses, and the grub becomes a *pupa*. The queen is 5½ days a larva and 8½ days a pupa, the worker 6 and 11, the drone 6 and 15 days respectively. The imprisoned grub does not at once fall into inactivity, but proceeds first to spin its chrysalis-robes. Alternately contracting and elongating its body, it at the same time allows filmy threads to exude from the orifices of spinning-glands situated on its lower lip. There are two such organs, and the resulting thread which the grub weaves round itself is therefore double. In a day and a half the worker-grub has spun a complete cocoon, and becomes a true resting pupa or bee-nymph. The male-grubs also spin complete cocoons, but those of the queen-grubs only enclose head, thorax, and the first ring of the abdomen.

Within the curtain of the cocoon important changes occur. The mummy-like pupa is gradually modified into the young bee. The skin, the segments, the appendages, and the internal organs undergo most marked changes, and on the twentieth or twenty-first day after egg-laying the young insect finally bursts its swaddling clothes, and emerges as a winged perfect insect or *imago*. The young queens are not allowed to escape when their metamorphoses are over. In the door of their cell a small hole is made, through which the royal prisoners are fed till the tone of their piping probably intimates their complete sexual maturity.

Functions and Habits.—It has been already noted that the social life of bees has resulted in some division of labor. At the beginning of spring the hive contains a single queen and a much-reduced contingent of workers. Their first care is to restore the normal population. Towards this end the queen lays numerous eggs which develop into *workers*. After the stock has been thus replenished, eggs are laid which turn out males or *drones*. After they begin to appear, eggs are laid which develop into more workers, and also into a few *queens*. The rapid increase of population culminates in the emigration known as *swarming*, when the old queen accompanied by a large contingent of subjects leaves the hive. The date of swarming is markedly affected by the temperature and the food-supply.

A populous stock will often send off three swarms in rapid succession. When the season and necessity for swarming are past, the young queens that remain imprisoned in the royal cells are liberated at once and allowed to fight for the sovereignty. The survivor then takes her nuptial flight.

Mating occurs in the air, followed by the death of the male. The newly impregnated queen thereupon returns to the hive to begin her egg-laying. It is a generally accepted conclusion that the queen mates but once, a single impregnation being sufficient for her lifetime of from two to four years. When swarming time is over, and the supply of honey decreases, the bees commence to rid the hives of the drones, henceforth mere useless consumers.

The queen bees are reared from special eggs, which begin to be laid after the drones appear on the scene. According to some, the queen herself deposits in the special royal cells the eggs which develop into future queens; according to others, the workers shift the eggs into these specially large cradles. They develop very rapidly in consequence of rich nutrition, attaining their maturity in about sixteen days.

Just as the drones and queens maintain the numbers of the hive so far as reproduction is concerned, so the supplies of food are collected by the myriads of workers. Among these there is some slight division of labor. Members of the community, varying in age and constitution, are told off to special tasks. Thus we can distinguish the external workers who collect nectar and pollen from those who attend to more internal domestic duties. Some of the internal workers, usually the young bees, act as nurses, effecting the mastication and semi-digestion of the food for the young larvæ, and caring for all the needs of the brood; while some wait upon the queen. Others again devote their energies, for a time at least, to the architecture of the cells, for which some of the heavy eaters secrete the wax. Others attend to the ventilation of the hive, which is apt to become hot enough not only to be disagreeable, but to soften the wax. These ventilators fan industriously with their wings, and produce air-currents through the hive strong enough to blow out a lighted match.

In the normal colony there may be as many as 20,000 workers to one queen and a few dozen or possibly a few hundred drones.

Feeding.—Bees feed principally on the nectar and pollen of flowers. In spring they frequent the early-flowering willow, hazel, plane, apple, pear, alder, gooseberry, currant, etc. The borage, the mignonette, the thyme, the heathers, the teazel, are also valuable sources of food.

When the bee proceeds to rob a flower of its nectar, the tongue, folded up when at rest, is protruded beyond its ensheathing parts, and is pushed as a probe into the flower-tube. By the action of the hairs on the outside of the tongue, or by the general action of the suctorial proboscis, helped by muscular contractions of the body, or by an ascent up the fine capillary tube of the tongue, the nectar is conveyed to the mouth, and later into the honey-bag, whence it is expelled, after undergoing certain changes, into the cell. (See HONEY.)

Besides the nectar, the *pollen* of flowers is essential to the normal life of bees; it is the ambrosia of the hive, and is largely used as food for the young. As the nectar is non-nitrogenous, the necessity for some other kind of food is obvious. Drones and queens, however, never eat raw pollen, and must therefore get their nitrogen indirectly. The special food supplied to the young is formed from pollen partly digested along with honey. The pollen is collected by the hairs of the body, from which it is cleaned off by the feet and jaws, damped with dew or other moisture, mixed with a little honey ejected from the mouth, kneaded into pellets, taken up by the brushes on the hind-legs, and deposited in the baskets in which it is carried home. The cargo thus brought to the hive may be immediately seized by the nursing bees, or may be stored up for future use. In the first case it is worked up by the nurses into a suitable state and given to the larvæ. In the other case the worker frees itself from its burden, pulling it off with the forelegs over a cell in the comb, and starts off again for more, while another bee packs the pollen into the cell, with the addition of a little honey, and covers it over with a varnish.

Bees also collect a resinous strongly adhesive, reddish-brown substance, known as *propolis*. This is obtained chiefly from the resinous exudations of such trees as fir, poplar, alder, birch, willow, horse-chestnut, etc., and is much used by the bees as a cement. With it they varnish the combs, stop up holes, and 'strengthen the outworks of their city.'

Formation of the Comb.—The wax used in the construction of the comb is manufactured by the bees themselves. The secretion is exuded from eight wax-pockets situated on the ventral surface of the abdomen. The wax projects in small flakes between the rings, is removed by the legs, shifted forward to the mouth, masticated by the jaws, and laid in heaps for the use of the comb-builders.

Each comb consists of rows of cells disposed at right angles to the comb. Each cell of this two-sided comb is a hexagonal prism, with its internal apex lying in the depression between three adjacent cells on the opposite side.

In some of the cells honey is placed for winter use; in some pollen is stored after being salivated and compressed by indoor workers, while others constitute the brood-cells, the cradles of the future young bees. These vary slightly in size. Those for workers are smaller and lower; those for the drones are broader and longer. In spring-time, after the drones have begun to appear, the royal cradles are formed for the young queens.

Beekeeping or ***Apiculture.***—Bee culture for the production of honey and wax for human use has been carried on for centuries. Apart from the frequent Scriptural mention of bees and honey, and the allusion to bees in the hieroglyphics of ancient Egypt four thousand years ago, Aristotle the philosopher, in the fourth century B.C., and, two hundred years later, Virgil the poet and Pliny the naturalist, all wrote about bees—Virgil's fourth Georgic being in itself a valuable book on bees and beekeeping. In mediæval times, too, it is recorded that the Saxon lord of the manor sometimes took part payment for rent of holdings in honey.

The seventeenth century was prolific in bee literature, but little additional knowledge was gained, and it was not until Huber, the blind naturalist of Geneva, began his investigations, and in 1792 published his *Nouvelles Observations sur les Abeilles*, that marked progress was made. In 1841 Prokopovitsh, a Russian beekeeper, who owned an apiary of 2,800 colonies of bees, made the first known attempt at constructing a hive with an upper chamber for surplus honey, and frames of combs that were capable of being removed. The introduction of the methods of modern beekeeping may, however, be said to date from the invention (1851) of the movable frame by the Rev. L. L. Langstroth, an American clergyman, who made perfect the frame devised by the Russian apiarist. The next important advance was made by the introduction of what is known as comb foundation—*i.e.*, thin sheets of beeswax, which, on being passed between embossed metal rollers, have impressed on their surface the outline of the cell base of natural comb. These sheets, when fitted in frames, ensure perfectly straight combs, and are readily adopted by bees as their own handiwork, thus effecting an enormous saving to them in labor and material. Other inventions tending to increase the production of honey and render the management of bees more easy have followed upon these, and to-day bee culture constitutes a profitable minor industry in the United States and elsewhere.

The first consideration in constructing the apiary is a locality rich in nectar-producing plants (see above). The hives should preferably face away from the prevailing winds and be protected from high winds, and should be shaded, especially during the heat of the day. Various arrangements of the hives have been adopted. An excellent one is placed in pairs three feet or more apart. As a general rule it is considered best to limit the number of colonies in a single apiary to 100 and to have apiaries at least 2 miles apart.

The hive, while light, so as to be easily moved about, should have walls of sufficient thickness to protect the bees alike from the extreme cold of winter and the excessive heat of summer, and of such material as will effectually shield them from rain or damp. Each hive is generally placed on a separate stand to raise it slightly above the ground.

The type of hive most commonly used in the United States is the Langstroth, consisting of a plain wooden box, holding a number of movable frames, hung from the top of the box, ½ to ⅜ of an inch apart and at a like distance from the top, sides, and bottom of the hive. The frames are made of four bars of wood joined at the corners, usually 14½ inches long by 8½ inches deep, and about an inch from side to side. The number depends on the size of the swarm to be accommodated, and on the honey-yielding capabilities of the district. Ten frames have generally been considered sufficient, although many beekeepers use hives containing as many as fifteen or even eighteen frames. The box thus constructed is the brood-chamber and storehouse of the bees, and is never despoiled of its sweets.

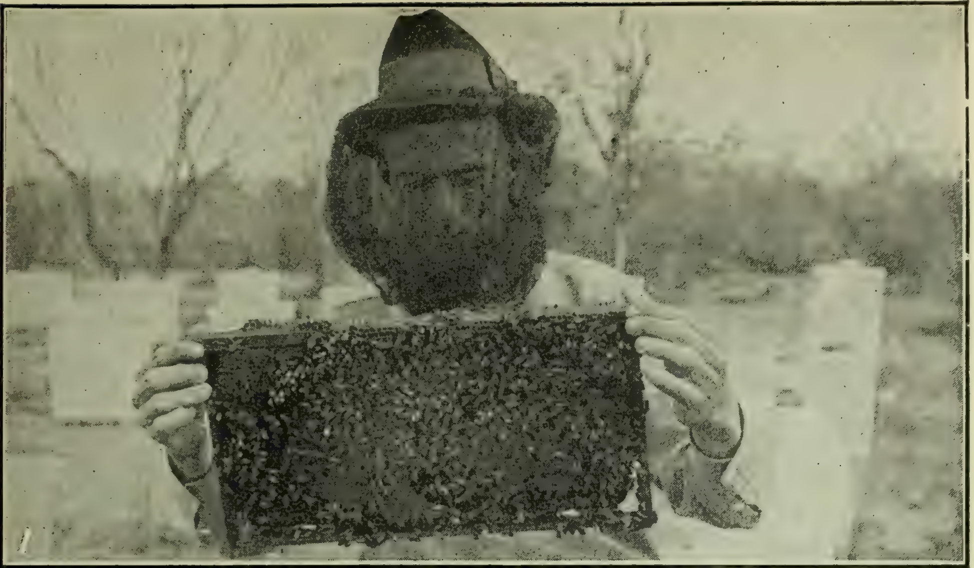
To provide accommodation for the storage of surplus honey, a bottomless box of corresponding dimensions, and fitted with frames—known as a 'super box'—is placed above the hive and covered with a suitable roof. It may be separated from the brood chamber by a zinc sheet perforated with slits of sufficient size to allow the passage of the workers but at the same time small enough to prevent the queen's leaving the brood chamber.

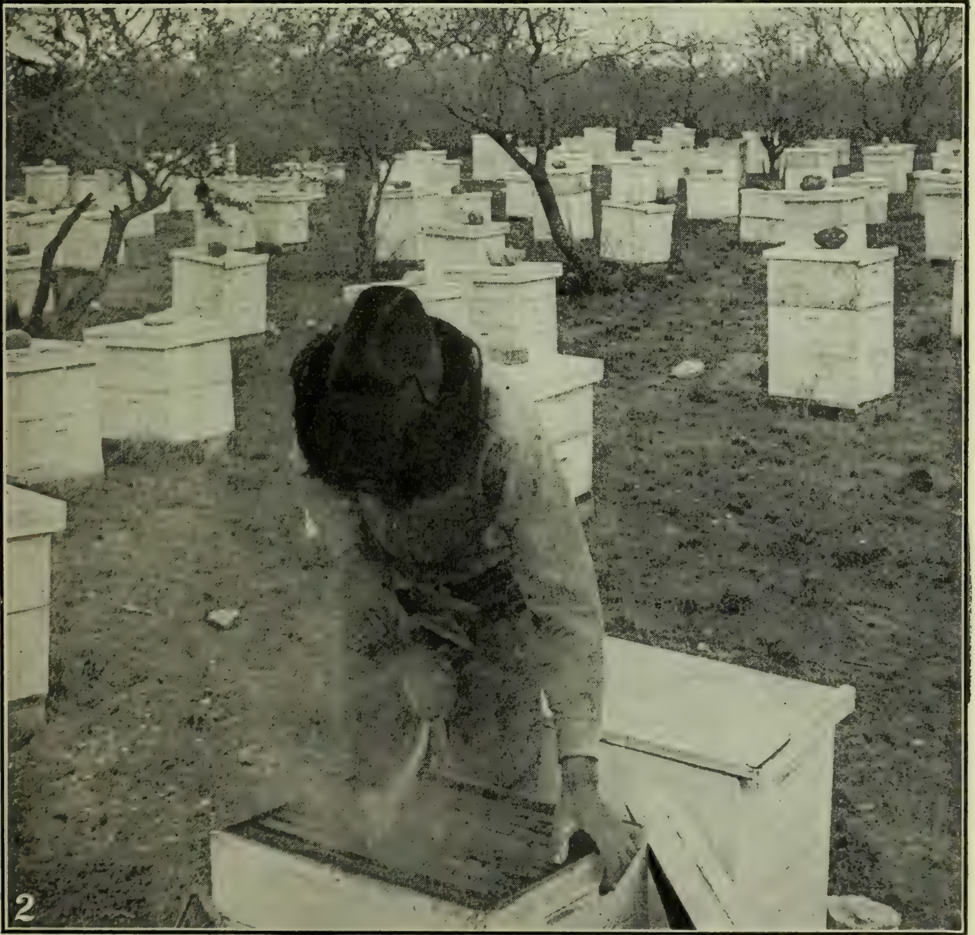
To obtain the honey the super-box is removed when full and replaced by an empty one. The capping of the cells is then cut off, and the bars are put into a machine known as the 'extractor.' This is a large cylinder containing wirework cages, that may be set in rapid rotatory motion. The centrifugal force throws out the honey, and the empty combs are replaced in the hive, to be again filled by the bees. By this method of working, the bees are saved the labor of comb-building, and large harvests of honey may be secured. For the production of comb honey special forms of 'supers' for holding small wooden sections are usually employed.

In securing the honey and in any other necessary manipulations, the bees should be handled so that they will be disturbed as little as possible in their work, and with proper precautions against stinging. The use of a good 'smoker' in the form of a miniature bellows in which a piece of cotton is kept smouldering is advisable. A few puffs of smoke directed into the entrance of the hive just before opening will cause the bees to gorge themselves with honey, as they do preparatory to swarming, and they may be handled without danger, though undue crowding or rough manipulation must be avoided.

The question as to the race and strain of bees to be kept is an important one. The most popular race in the United States is the Italian, introduced from Northern Italy. Other varieties are the Black or German Bees, the Gaucasians, Carniolans, Cyprians, and Syrians.

The control of swarming is a very important feature of bee raising. When a swarm issues from the hive it commonly settles on the limb of a nearby tree or bush. This may be sawed off and the bees may be carried on it to the hive or they may be shaken off into a box or basket and hived. To avoid the necessity of watching for swarms and the chance of eventually losing them, methods of *artificial*





BEE KEEPING

1. The Bees made Harmless by Smoke, Clinging to the Frame after its Removal from the Hive. Note the character of the comb.

2. Smoking the Bees before Robbing the Hive of its Honey. The Hives are of the Langstroth Type.

swarming are now practised by all advanced beekeepers. An empty hive is placed on the site of the hive to be swarmed, which is itself moved aside. The frames of bees are lifted out and examined one by one until the queen is discovered, when the comb on which she is found is placed in the empty hive. One or two brood-combs are also removed and placed along with it. The hive is filled up with empty bars and covered up as before. Empty bars take the place of those removed from the old hive, which is taken to a new situation in the garden, when the work is complete. All the bees on wing during the operation, as well as the old bees in the swarmed hive, will make their way to the new hive on the old site.

Feeding.—A hive should have at least 20 pounds of honey stored for winter use. After the season is over it may be found that the supply is deficient, and as bees should never be fed during the winter months, the quantity should be made up before cold weather sets in. If fed in autumn, a strong colony will easily store away a quart of sirup in 24 hours, and the whole winter supply may be thus given in a few days. A good feeding sirup may be made by dissolving 4 pounds of cane-sugar in 2 pints (40 ounces) of water over a gentle fire. A tablespoonful of vinegar should be added to prevent the sirup from recrystallizing in the combs. One-fourth of a pint of this given daily will be found to be sufficient.

Parasites and Diseases.—On the adult bee lice are common pests, while the larvæ of the ichneumon do great damage to the grubs. Honey-bees, however, are apparently exempt from the attacks of the latter, which appear to be unable to gain access to their dwellings. The adult honey-bee is greatly troubled by the bee-louse (*Braula cæca*) and by the bee-fly (*Phora incrassata*). The larvæ are often devoured by a species of beetle (*Trichodes*).

The most common diseases to be guarded against are Bee Paralysis and Dysentery, which attack the adult bees, and American and European Foul Brood, which destroy the larvæ. American Foul Brood attacks the hive just as pupation has begun, the larvæ die, turn dark brown in color, and form a mass of decayed tissue of a peculiar ropy character. The onset of European Foul Brood is at a somewhat later stage, and the dead larvæ show a characteristic yellow or grayish color. Treatment of both infections consists in the complete removal from the hive by various methods of all infected material.

Bibliography.—Consult *Farmer's Bulletin* 442 *and* 447 (U. S. Department of Agriculture); *Langstroth on the Hive and Honey Bee;* Maeterlinck's *Life of the Bee* (translated by Sutro); Root's *ABC and XYZ of Bee Culture*; E. F. Phillips' *Bee-keeping*(1915); F. C. Pellet's *Productive Bee Keeping* (1916); J. G. Digges' *Practical Bee Guide* (4th ed., 1918).

Beeston, town, Nottinghamshire, England, on the river Trent; 3½ miles southwest of Nottingham. It is a manufacturing community, producing lace, machinery, bicycles, and automobiles. Pop. (1911) 11,336.

Beeswax, a yellow solid secreted by bees and used in the formation of the honeycomb. It breaks with a granular fracture, and has an agreeable honey-like odor. It is prepared for use by draining away the honey and heating the wax in water, on which it floats, and solidifies on cooling. It melts at about 64° C., is soluble in ether, chloroform, or benzine, but only partly soluble in alcohol. It may be bleached by chlorine or nitric acid, but a much better product is obtained by exposure in thin layers to sunshine, it being at the same time kept moist. Beeswax is used for making candles, waxing polished floors, in medicine as an ingredient in plasters and ointments, and for many other purposes. It is often adulterated with paraffin wax, vegetable waxes, and fats.

Beet (*Beta*), a garden vegetable grown for its fleshy, edible root, belonging to the order Chenopodiaceæ. There are four or five species of the genus *Beta*, but *B. vulgaris*, from which all the garden varieties are derived, is the only one of economic importance. The original home of the plant was Southern Europe, along the Mediterranean coast, and as far east as the Caspian Sea and Persia. Its cultivation dates from two or three centuries B.C. The plants are mostly biennial and are grown exclusively from seeds. They have dark green, smooth, wavy-margined leaves, which when young are used for 'greens,' and tall flowering stems. The roots are carrot-like in some varieties and turnip-shaped in others. They are of a purple or crimson color of varying depth.

Beets thrive at a low temperature and are therefore suited to the cooler countries. They may be cultivated in the open or under glass and are an important crop in truck gardening. They require a loose, well-drained, light, clean, rich soil which has been carefully tilled. Fully rotted barn manure with a good potash fertilizer and a light application of nitrate of soda are beneficial. In ordinary gardening the seed should be sown early in the spring, an inch deep, in rows two to three feet apart to admit of horse cultivation. After thinning, which may be done when the plants are sufficiently grown to be used as 'greens,' they may be left about four inches apart. For market gardening the rows may be placed nearer together and the plants thinned to six inches apart. As a fall crop, beets are planted in June, and the roots are pulled after the first frost, and stored in cellars. The average yield of mature beets is 300 bushels per acre.

Some of the popular varieties of garden beet are Bassano, a white and red mixed; Early Blood Turnip, a deep rich red, turnip-shaped; Eclipse, bright red, fine-grained, and sweet; Egyptian, a rich deep red, with small tops; Edmand, round, smooth, and of good flavor.

Chard, or *Swiss Chard* is a variety of beet grown for its large succulent leaves, which are cooked and eaten like asparagus; the tender young leaves are used as a pot-herb and for salads. *Foliage Beets*, the ribs of whose leaves are beautifully colored, are grown for ornamental purposes and make excellent borders.

The *Sugar Beet* is of the same species as the common garden variety but of a higher sugar content. See SUGAR BEET.

The *Mangel-wurzel* or *Fodder Beet* is a coarse large form of the common beet grown for animal food. It is largely grown in Europe and in Canada, but is also adapted to the Northern United States. The soil requirements are about the same as for sugar beets, but the cultural methods differ in that the fodder beet may be spaced a little farther apart in the row.

Insect Pests and Diseases.—Several species of insects feed on beets, but the flea beetle is the only one of importance. Leaf-spot and potato scab are the most troublesome diseases; the former being more common to sugar beets than to the garden variety. Bordeaux mixture is beneficial in all these cases.

See SUGAR; SUGAR BEET. Consult *Farmers' Bulletin* 52 (U. S. Department of Agriculture).

Beet Fly (*Anthomyia betæ*), an insect the maggots of which feed on the pulp of beet leaves, and thus reduce them to dry skin. The eggs are laid beneath the leaves, and as soon as the maggots are hatched they start feeding, feed for a month, and then turn to chestnut-brown pupæ. The flies come out in about a fortnight—ashy gray, with black, bristly hairs. There are two broods—one in summer and one in autumn. Spraying with some poisonous solution is recommended.

Beethoven, LUDWIG VAN (b. Bonn, Dec. 16, 1770; d. Vienna, Mar. 26, 1827), one of the greatest of musical composers. As a child he displayed unusual talent for music, and from the age of four was taught the violin and clavier by his father, a tenor singer in the band of the elector of Cologne at Bonn. When nine years old he was placed with Pfeiffer, and received lessons on the organ from Van der Eeden, and then from Neefe. Before Beethoven was twelve he could play the greater part of Bach's *Wohltemperirtes Clavier*, and had acted as deputy organist during Neefe's temporary absence in Münster. About this time he was appointed *cembalist*—practically conductor—of the opera band at the theatre. During 1785 he studied the violin with Franz Ries, and in 1787 paid a visit of some months to Vienna, where he had a few lessons from Mozart. His career at this period was greatly influenced by his friendship with the Breuning family and with Count Waldstein—to whom, in 1803, Beethoven dedicated his famous piano sonata (Op. 53). Beethoven had already earned much distinction as a pianist and improviser, but he further enhanced his reputation as a composer by writing a set of brilliant variations for the piano, which he dedicated to his friend the Countess of Hatzfeldt. In July, 1792, while on a visit to Bonn, Haydn 'greatly praised' a composition of Beethoven's which had been submitted to him; and in the autumn of that year Beethoven placed himself under Haydn in Vienna, where he spent the rest of his life. Not wholly satisfied with his progress under Haydn, he also became a pupil of Schenk; and after Haydn left for England, he studied counterpoint with Albrechtsberger, the violin with Schuppanzigh, the writing of quartets with Aloys Förster, and Italian vocal composition with Salleri. Of the many friends Beethoven made among the aristocracy of Vienna may be mentioned Prince and Princess Lichnowsky, whose admiration for him took the practical form of presenting him with a quartet of valuable instruments and a pension of $300 a year, in addition to giving him a home with them; but the regular hours and formalities soon proved irksome to him. When twenty-eight years of age he began to suffer from partial deafness, which increased to such an extent that from 1822 onwards all communication with him had to be made in writing. Notwithstanding this, many of his greatest works were composed during this period. In 1808 Jerome Bonaparte, king of Westphalia, offered Beethoven the post of *maître de chapelle* at Cassel, with an annual salary of $1,500; but as several noblemen subscribed to a fund which guaranteed him a yearly pension of about $1,050, he was induced to remain in Vienna. Unfortunately, after the death of Prince Lobkowitz (1816) this pension was reduced to about $550.

At the age of ten Beethoven began the work of composition, and even for some time after the years of his pupilage wrote in accordance with the principles observed by Haydn, Mozart, and others; but at a later period he gradually introduced changes of treatment in individual sections, and also developed considerably some of the musical forms of his predecessors. His greater choice of keys in modulations, his development of the minuet into the scherzo, his unique use and treatment of variations, his revival of *programme* music, which had been almost entirely neglected since its introduction by Bach, also his innovations in the construction of the introduction, coda, finale, and connective phrases of symphonies, may be instanced as indicating the nature of his principal divergences from pre-existing compositions. His symphonies, concertos, chamber music, string quartets, sonatas for violin and for violin and piano, would each have been sufficient to earn for their composer undying fame. His vocal compositions include an oratorio, *The Mount of Olives*, two *Masses*, the *Choral Symphony*, and many other great works, besides a large number of songs, etc. By executive musicians Beethoven's compositions are acknowledged to be the supreme tests, intellectual gifts of the highest order being as essential as technical skill. See *Beethoven*, by Moscheles (1841); *Etude Analytique des Symphonies de Beethoven*, by Berboz (1844); *Beethoven*, by Richard Wagner (Eng. trans. by Parsons, New York, 1883); *Beethoven and his Nine Symphonies*, by Sir G. Grove (1893); Wagner's *A Pilgrimage to Beethoven* (trans. by Weyer, Chicago, 1897); and the most exhaustive work yet written, his *Life*, by A. W. Thayer, an American (1876–78; 2nd ed. 1901).

Beetles (Coleoptera), a well-defined order of insects in which the cuticle is hard, and the first pair of wings are converted into scalelike wing covers (elytra), which cover and protect the posterior part of the body. The second pair of wings may function as organs of flight, or may be absent; but, as a rule, beetles are not adapted for an aerial life, and live mostly in concealed situations. The order is rich in species, some 150,000 being said to be known. In classifying beetles, reliance is chiefly placed upon the shape of the antennæ and the number of joints in the tarsus. Thus, the lamellicorns—beetles with the terminal joints of the antennæ leaflike—constitute a very familiar series, including the stag-beetles and the very numerous dung-beetles. The diet of beetles is very varied, but all are voracious; the weevils (Rhynchophora) may be mentioned as a group whose destructive habits render them of economic importance.

Beets, NIKOLAAS (1814–1903), Dutch writer, born at Haarlem; was pastor of Heemstede (1840) and Utrecht (1854), and professor of theology (1875–84) at Utrecht University, but is chiefly noteworthy as the author of stories and sketches of Dutch life in graceful and humorous prose—*Camera Obscura* (1839; 18th ed. 1888), a Dutch classic, published under the pseudonym of Hildebrand, and with a continuation, *Na Vijftig Jaar* (1887). Besides this he wrote critical essays on literature, theological works, and poems (*Dichtwerken*, 5 vols. 1886–91).

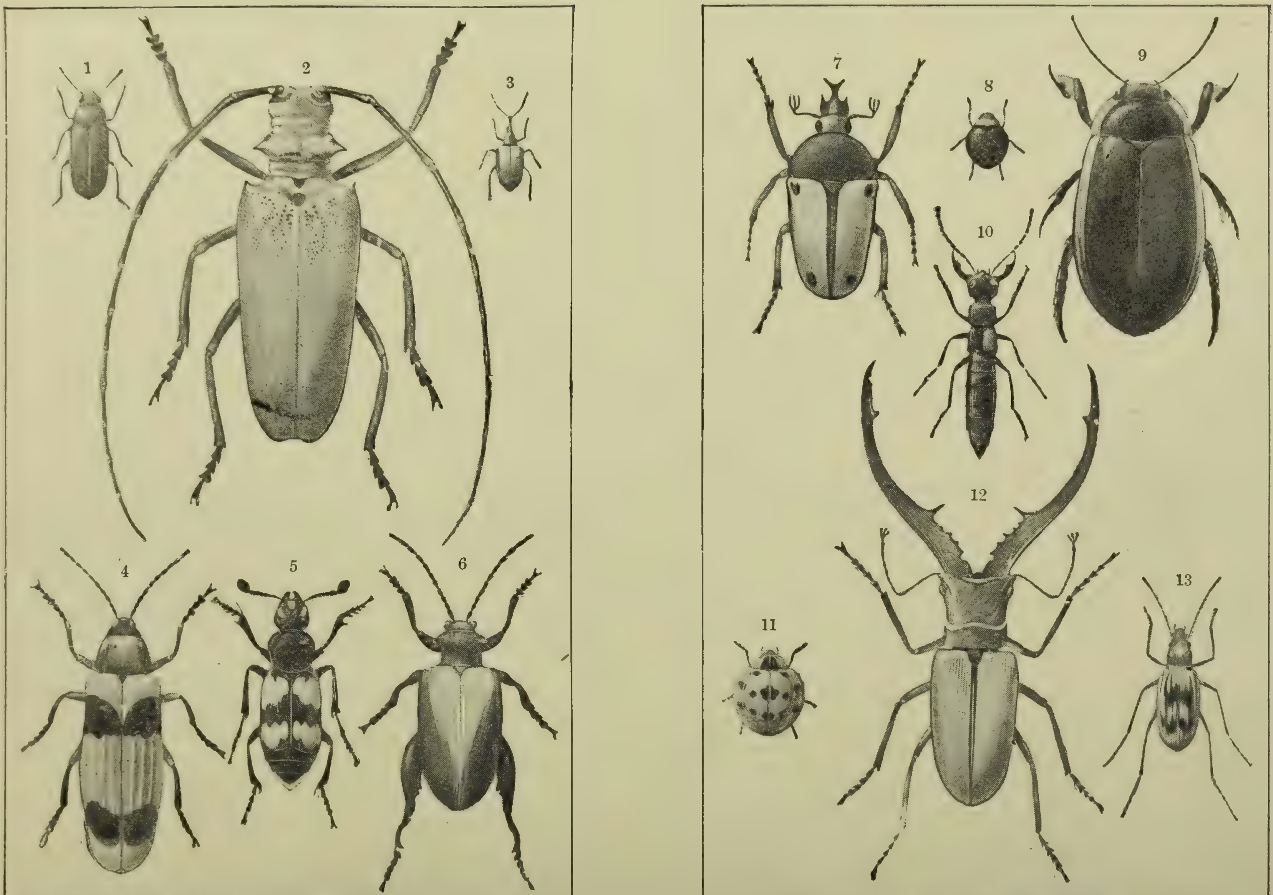
Beeville, tn., Tex., co. seat of Bee co., 90 m. S.E. of San Antonio, on the Southern Pac. and the San Ant. and Aransas Pass R. Rs. It has a good trade in cotton, live stock, oranges, bananas and market garden products. Pop. (1910) 3,269.

Befana (corruption of 'Epiphany'), legendary old woman who, sweeping the house when the three wise men passed by with gifts to the infant Christ, put off seeing them till their return, and is still awaiting them. At her festival (Jan. 5) in Italy her effigy is in places carried about, followed by an admiring crowd. Counterpart to the Wandering Jew and Santa Claus, and fused in Germany with the heathen Berchta, Befana served as a scare to naughty children. On Twelfth Night, in Italy, Befana brings to good children toys and sweets, but to bad children ashes.

Beg, more commonly BEY ('lord'), Mohammedan title of the governor of a district or town, but now also applied to officers, and used by almost every Turk of gentle birth.

Begas, REINHOLD (1831), German sculptor, a pupil of Rauch He first attracted notice by the *Borussia* (1861), on the façade of the Berlin Exchange, and confirmed his reputation by his statue

Died [illegible]



1. Heteromera (*Tenebrio*). 2. Longicornia (*Batocera*). 3. Rhyncophora (*Eustales*). 4. Serricornia (*Chrysochroa*). 5. Clavicornia (*Necrophorus*). 6. Phytophaga (*Sagro*).

7. Lamellicornia *Ceratorrhina*). 8. Malacodermata (*Allochotes*). 9. Hydradephaga (*Cybister*). 10. Brachelytra (*Ocypus*). 11. Pseudotremera (*Synonychal*). 12. Pectinicornia (*Cyclommatus*). 13. Geodephaga (*Nebria*).

REPRESENTATIVE BEETLES.

of Schiller (1871), in the same city. Other works are monuments to the Emperor William (1893–97), Bismarck (1901), the bronze Neptune fountain in Berlin (1891), and busts of the Emperor, Frederick III. and his Empress, William II., Moltke, Menzel, and others.

Died Oct 8 1929

Begbie, HAROLD (1871–), English author, was born in Fornham St. Martin, Suffolk, and was educated privately. His publications include: *The Political Struwwelpeter* (1899); *The Struwwelpeter Alphabet* (1899); *Great Men* (1899); *The Handy Man* (1900); *The Fall of the Curtain* (1901); *The Adventures of Sir John Sparrow* (1902); *Bundy in the Greenwood* (1902); *The Priest* (1906); *The Cage* (1909); *Broken Earthenware*, published in the United States as *Twice-Born Men* (1910); *The Challenge* (1911); *The Lady Next Door* (1912); *The District Lamp* (1912); *The Day that Changed the World* (1913); *The Proof of God* (1914); *On Our Side of the Angels* (1915); *Mrs. O'H'* (1916); *The Vindication of Great Britain* (1916); *An English Family* (1919); *Mr. Sterling Sticks It Out* (1919); *Life of William Booth* (1919); *The Ways of Laughter* (1920).

Begbie, SIR MATTHEW BAILLIE (1819–94), Canadian jurist, was born in Edinburgh, Scotland, and was educated in St. Peter's College, Cambridge. He was called to the bar in 1844 and practised law in England until 1858, when he was sent to British Columbia as judge of the colony. In 1870 he became Chief Justice of British Columbia, an office which he filled with great wisdom and firmness until his death. He was knighted in 1871.

Begg, JAMES (1808–83), Scottish Free Church minister, one of the leaders of the evangelical party in the movement that culminated in the disruption of the Church of Scotland (1843). In the new Free Church, Dr. Begg was the leader of the constitutional (or conservative) party, and the resolute opponent of voluntaryism, of relaxation of the terms of subscription, and especially of the projected union with the United Presbyterian Church in the 'sixties. Consult *Memoirs*, by Professor T. Smith.

Beggar. See VAGRANTS.

Beg'gar-my-neigh'bor, a game at cards similar to that of 'catch honors.' The cards are dealt face downwards among the players, usually two in number. The players then lay down card after card in turn, face uppermost, until a court card is turned up. If this be an ace the player's adversary pays him four cards; if a king, three cards; if a queen, two cards; and if a knave, one card; while he takes up also all of the cards previously laid down, and puts them underneath those in his hand. If in the course of payment an honor is turned, then the creditor becomes the debtor to the value of the honor. Play continues until one player obtains all the cards in the pack.

Beggar's Lice (*Echinospermum virginicum*), or STICKSEED, a common weed found in woods and thickets and along waysides, from Canada southward.. It grows from 2 to 4 feet high, with widely spreading branches, bearing oblong leaves, small whitish flowers, and globular nutlets covered with barbed prickles.

Beggar Tick, the name applied to several varieties of the Bur Marigold (*Bidens*), annual or perennial herbs in which the achenes are flattened parallel with the bracts of the involucre, or slender and four-sided, crowned with barbed awns or short teeth.

Beghards, beg'ärdz, an association of men corresponding to the female Beguinages (see BEGUINES). The earliest record shows them established at Louvain about 1220. They spread through the Netherlands, Germany, France, and even into Italy. As they took no vows and were under lax discipline, heretics and disreputable characters became associated with them, and the authorities and ultimately the populace regarded them with disfavor. Toward the end of the 14th century severe measures were enforced against them and they were dispersed or became absorbed in the older and better regulated orders.

Beghrmi. See BAGHIRMI.

Begin, LOUIS NAZAIRE (1840–), Canadian cardinal, was born in Levis, Que. He was educated at Laval University, from which he was graduated in 1863, and studied theology in Rome, where he was ordained priest in 1865. He was professor of dogmatic theology and ecclesiastical history in Laval University from 1868 to 1884; was principal of the Laval Normal School from 1885 to 1888; became bishop of Chicoutimi in 1888, and coadjutor to Cardinal Taschereau, with the title of archbishop of Cyrene, in 1891. He was made archbishop of Quebec in 1898, and was elected a cardinal in 1914. His writings include *La primauté et l'infaillibilité des souverains pontifes* (1873); *La Sainte Écriture et la règle de la foi* (1874); *Aide-mémoire, ou chronologie de l'histoire du Canada* (1886); *Cathéchisme de controverse* (1902).

Bègles, beg'l', town, France, department of Gironde, 2½ miles southeast of Bordeaux, near the left bank of the Garonne. Pop. (1911) 14,055.

Begonia, bi-gō'ni-*a*, a genus of tropical plants belonging to the order Begonaceæ, including nearly 500 species and many hybrids and variations, grown either for their beautiful foliage or for their showy blooms. Begonias are indigenous to Mexico, Central and South America, Asia, and South Africa; the first plants were introduced into England about 1780. They are succulent herbs or low-growing shrubs with diverse root systems, varying from a thick rhizome to a distinct tuber. The leaves are alternate, more or less irregular in shape, and vary greatly in size and texture; the flowers are monœcious, pink, white, rose, scarlet, and yellow in color, with many stamens; the fruit is usually a colored capsule containing numerous tiny seeds.

The cultivated varieties of begonia may be considered under four headings — the fibrous-rooted, or winter-flowering; the ornamental-leaved, or rex; the tuberous, or summer-flowering; the semi-tuberous, winter-flowering. Members of the first class, such as *B. nitida*, *B. semperflorens*, and *B. haageana*, require a temperature which never falls below 50° at night. Cuttings taken in March from vigorous stems will make good plants for later winter or early spring flowering. Suitable soil is composed of two parts loam, one part rotted manure, one part leaf mould, and one part sand. These fibrous-rooted begonias make excellent house plants and are easily grown.

The *rex* begonias, which include a number of varieties derived from *B. rex* crossed with two or three other species, are grown for their large, beautifully shaped, and often brilliantly colored leaves, their flowers being usually small and insignificant. They do not need so high a temperature as that required for the winter-flowering begonias, but do best in the intermediate house or a warm greenhouse. They should be shaded from strong sunlight during the summer months, and flourish best in a moist atmosphere. Soil similar to that suggested for the fibrous-rooted class is suitable for the rex varieties. Propagation is best effected by means of leaf cuttings.

The tuberous-rooted begonia is the most popular and commercially the most important variety. Its profuse flowering habit, the great range and brilliance of its colors—from yellow to bronze, red to orange, white to pink—and the ease with which it may be cultivated, have all contributed to its success. It is half hardy, and the tubers must, therefore, be lifted before frost has touched them; but as they are dormant during the winter, they may be stored anywhere that the temperature about them does not fall to freezing point. They may be grown in pots or conservatories as well as in the open air. Propagation is effected by means of seeds or cuttings. The semi-tuberous begonias include such plants as *B. socotrana*, a familiar variety of which is *Gloire de Lorraine*. They require a temperature of at least 60° at night, and great care is needed in their cultivation.

Begonia, Single Tuberous Variety

Beg-Shehr. See BEISHEHR GÖL.

Beguines, beg'inz (Beguinæ, Beguttæ), a semi-monastic association of women formed during the twelfth century, probably by Lambert le Bègue, a priest of Liège. They lived in villages or communities known as 'beguinages' (from *beginagium*, 'a vineyard') and devoted themselves to nursing the sick, the care of the poor, and other charitable and pious works. They took no vows, retained any property they might possess, and were free to marry or to leave the association at any time. These associations soon spread throughout Belgium, the Netherlands, France, and Germany. In the latter half of the thirteenth century, in company with the Franciscans, the order suffered persecution as an heretical sect, and the beguinages gradually disappeared or survived only as almshouses for poor spinsters. There are at present some twenty beguinages in Belgium and Holland, notably the two at Ghent, one at Amsterdam, and one at Breda. There is also one in France at Castelnaudary. See also BEGHARDS.

Begum, bē'gum, a Hindustani name denoting a woman of high rank, used principally of Mohammedan queens-regnant. The term is also applied to the sultanas of seraglios.

Behaim, bā'hīm, BOEHEIM, or BEHEM, MARTIN (*c.* 1495–1506), German cosmographer, was born in Nüremberg, studied under Regiomontanus, and in 1484 accompanied the Portuguese Diogo Cão (Cam) on a voyage of discovery in which they reached the mouth of the Congo River. In 1486 he settled at Horta, the capital of Fayal, in the Azores. He is remembered especially for the globe which he constructed at Nüremberg in 1492 (twenty-one inches in diameter), the oldest globe extant. He also devised a portable sun-dial to be used in finding the latitude at sea, and is credited with having introduced small astrolabes of brass into the Portuguese navy in place of unwieldy instruments previously in use. Consult Ravenstein's *Martin Behaim: His Life and His Globe.*

Behar. See BIHAR.

Beheading. See CAPITAL PUNISHMENT.

Behemoth, bē-hē'moth, a colossal animal, real or imaginary, described with leviathan in Job xl. 15–24, and referred to in the Book of Enoch, lx. 7–9, and 4 Esdras vi. 49–52. It is generally identified with the hippopotamus, but the representation shows traces of a mythical element.

Behera, be-hā'rä, province of Lower Egypt, with an area of 1,726 square miles. The capital is Damanhur. Cotton is cultivated. Pop. (1917) 892,246.

Behistun, bā-his-to͞on', BISUTUN, or BAGHISTAN, mountain in the province of Kermanshah, Persia, about 22 miles east of Kermanshah. It rises to a perpendicular height of 1,700 feet and about 300 feet above ground bears sculptures and cuneiform inscriptions (in three languages—Persian, Babylonian, and Median) recording the deeds of Darius Hydaspes (500 B.C.). Darius is represented as standing with his foot upon a prostrate man with upstretched hands; back of him are two warriors; before him nine captives with hands tied behind their backs and chains about their necks. The inscriptions, which were deciphered and translated by Major-Gen. Sir Henry Rawlinson, in 1835–7, set forth the king's genealogy and victorious deeds.

Behm, bām, ERNST (1830–84), German geographer, was born in Gotha. His chief work was the compilation (with Hermann Wagner) of *Bevölkerung der Erde* (7 vols., 1872–82). He was also editor of *Geographisches Jahrbuch* (1866–86), and of *Petermann's Mitteilungen* (1878–84).

Behmen, JACOB. See BOEHME.

Behn, bān, APHRA (1640–89), English dramatist and novelist, 'the George Sand of the restoration,' was driven after the death of her husband, a wealthy Dutch merchant, to support herself by her pen, and thus became the first professional Englishwoman of letters. Her dramas (of which the most successful, *The Rovers*, held the stage long after her death) are marked by much coarseness, but also by ability and a genuine lyrical faculty. The best known of her tales is probably *Oroonoko, or the Royal Slave* (1698), upon which Thomas Southerne based his popular tragedy of that name. A late edition of her *Works* appeared in 6 volumes in 1871.

Behring. See BERING.

Behring, bē'ring, EMIL ADOLF (1854–1917), German physician, was born in Hansdorf, Prussia, and was educated in the Army Medical College, Berlin, from which he was graduated in 1878. In 1899 he was made assistant in the Institute of Hygiene, Berlin, and three years later was transferred to Koch's Institute for Infectious Diseases, where he began the research work on diphtheria which resulted in his discovery of diphtheria antitoxin. For this work he received the Nobel prize in Medicine, 1901. In 1894 he was appointed to the chair of Hygiene in the University of Halle, and the following year became director of the Institute of Hygiene in Marburg. He is notable also for his research work on tuberculosis, particularly bovine tuberculosis.

Beijerland, bī'y*e*r-länt, island, Holland, between the Old Maas and the Hollandsche Diep. Its fertile soil yields much flax.

Beilan, bā-län', town and pass in the northern corner of Syria, on the trade route from the interior to Alexandretta (Iskanderun). The pass (1,800 ft. high) lies between the Alma-Dagh Mountains and Jebel-el-Ahmer, and is believed to be the ancient Syrian Gates. The town was the scene of a battle between the Turks and the Egyptians in 1832. Pop. 5,000.

Beilstein, bīl'shtīn, FRIEDRICH KONRAD (1838–1905), Russian chemist, was born in St. Petersburg, and studied under Bunsen, Liebig, Wöhler, and Würtz. He was graduated in 1858 from Göttingen, became assistant in the university laboratory in 1860, and extraordinary professor of chemistry in 1865. He was professor of chemistry in the Technological Institute in St. Petersburg from 1866 to 1896, during part of which time he held also the professorship in the Imperial Academy of Science, and other posts. Beilstein is world famous for his *Handbuch der organischen Chemie* (3rd ed. 4 vols. 1892–9; with continuations from 1900 onwards, ed. Jacobson). He also wrote *Anleitung zur qualitativen Analyse* (8th ed., by E. Schulze and Winterstein, 1898).

Beira, bā'ē-rä, province, Portugal, extending from the Atlantic to the Spanish frontier, and having the Douro for its northern boundary, and the Tagus for part of its southern boundary. The Serra da Estrella, a bare, heath-clad, granite range (6,540 feet high), seamed by numerous picturesque dells and valleys, traverses the interior. Coal, iron, and salt are mined, marble is quarried, and there are mineral springs. Grain, oil, and wine are produced, and fishing is extensively carried on. Area, 9,208 square miles. Pop. (1911) 1,626,484. The capital and chief town is Coimbra.

Beira, seaport, Portuguese East Africa, capital of district of Beira, at the mouth of the Pungwe River and the terminus of the Mashonaland Railway; 35 miles north of Sofala. The harbor is good, and a breakwater guards the town from the encroachments of the sea. Beira has a hospital, three schools, and public gardens. It exports sugar, rubber, beeswax, ivory and hides, and imports cotton goods, foodstuffs, and alcoholic liquors. Pop. (1919) 9,227 (1,301 whites).

Beiram. See BAIRAM.

Beirut, bā'rōōt, or BEYROUT, Mediterranean seaport, Syria, capital of a vilayet of same name, is situated on St. George's Bay in a plain backed by the mountain of Lebanon; 90 miles northwest of Damascus, whose port it is. It is the most healthful place on the coast, having temperate summers, a plentiful rainfall in winter, and a good water supply. It is the seat of a Greek and a Maronite bishop, and of the United Greek Patriarch of the Orient, and is the centre of several foreign missions. It has a university, an astronomical observatory, a society of Oriental languages, and many mosques, Christian churches, and schools. The American College (Presb.) is probably the most influential educational institution in Syria. Silk stuffs, gold and silver thread, and porous earthenware are manufactured, and through the port pass the imports and exports of all Syria. Exports consist chiefly of silk, wool, oils, soap, lemons, and oranges; imports of iron, cotton goods, coffee, rice, sugar, and fancy goods. In pre-war years the foreign trade reached more than $10,600,000 annually, of which $3,600,000 represented exports and $7,000,000 imports. The population is about 180,000, over one-fourth of which is Mohammedan.

Beirut is the ancient Berytus, and was a port of the Phœnicians. It later came under the power of Egypt, from whom it was taken by Antiochus the Great, and so became part of Syria. Conquered for the Romans by Agrippa, it was made by Augustus a military colony, under the name of Colonia Julia Augustus Felix Berytus. During the crusades it belonged alternately to the Christians and to the Saracens. It fell under the power of the Turks in 1763; was conquered by Ibrahim Pasha, son of Mehemet Ali of Egypt, in 1831; and on Sept. 10, 1840, was bombarded by the allied English, Austrian, and Turkish fleets, until evacuated by the Egyptians. Its modern growth dates from 1843, when steam navigation was introduced. In the Great War Beirut was occupied by British and French troops, Oct. 7, 1919. It was placed under French administration in December 1919. See illustration, page 13.

Beisa. See ORYX.

Beishehr Göl, bā-she'h'r gûl, lake, Asia Minor, 40 miles west of Konieh. It is 38 miles long by 5 to 10 miles broad, and drains into the Soghla Göl (lake), to the southeast. The town of Beishehr is situated on its eastern shore, and Kirili near its northeastern shore, whence the lake is called also Kirili Göl.

Beissel, bī's*e*l, JOHANN CONRAD (1690–1768), German-American religious propagandist, was born in Eberbach, in the Palatinate. He studied theology, was banished for irregular religious views, and settled in Germantown, Pennsylvania, about 1720, where he later allied himself with the Dunkards. His advocacy of the seventh day of the week as the only true Sabbath caused a division in this sect, a group known as the Seventh Day Dunkards withdrawing under his leadership. In 1732 he founded, at the present village of Ephrata, a communistic society organized upon a basis of voluntary celibacy, within which the members assumed monastic names, his being Friedsam Gottrecht. After Beissel's death the community declined and the few remaining members were incorporated as Seventh Day Baptists. He composed words and music for several volumes of hymns in German and Latin (1766–73), and published several other volumes.

Beit-el-Fakih, bāt'el-fä'kēh, trading centre in Yemen, Arabia, near the Red Sea, 37 miles southeast of Hodeida. Pop. 8,000.

Beja, bā'zhä (anc. *Pax Julia*), town and episcopal see, Portugal, in the district of Beja; 95 miles southeast of Lisbon. Interesting buildings are a mediæval castle, the cathedral, and the convent of Nossa Senhora da Conceição, dating from the 15th century. There are manufactures of leather and pottery, and olive oil refineries. Pop. (1911) 10,113.

Beja, administrative district of the province of Alemtejo, Portugal, with an area of 3,958 square miles. Pop. (1911) 192,499.

Bejan, bē'j*a*n, or BAJAN (*cf.* Fr. *bec jaune*, Med. Lat. *bejanus*, 'yellow beak'), the common name for freshmen in universities in the Middle Ages. The idea, which appears also in the German *Gelbschnabel*, is that of a young bird whose beak has not lost its first yellow tint.

Bejapur. See BIJAPUR.

Bekaa, bē'kä, EL, or EL BIKA, a valley in Syria, lying at an altitude of 2,600 to 3,000 feet, between the ranges of the Lebanon, stretching from the sources of the Jordan to the upper course of the Nahr-el-Asi (anc. *Orontes*), and traversed by the Nahr-el-Litany (anc. *Leontes*). This valley is the ancient Cœle-Syria (in the Old Testament *Hamath*). Its principal town, Baalbek, situated near the source of the Nahr-el-Litany, is mentioned in the hieroglyphic and cuneiform inscriptions as Balbiki, from the Semitic Baal-Beka.

Beke, bēk, CHARLES TILSTONE (1800–74), English explorer, was born in Stepney, Middlesex, studied law, and in 1834 published the results of his researches in primeval history, under the title *Origines Biblicæ.* In 1840 he visited Abyssinia, and made important discoveries as to the true structure of the mountain ranges in East Africa. In 1848 he organized an expedition to explore the sources of the Nile, starting from Zanzibar; but the expedition was only partially carried out. He visited Theodore of Abyssinia in 1864, to urge the release of Captain Cameron and the other imprisoned British subjects, and afterward furnished maps and information to Napier's military expedition (1868). Much of his time was devoted to the identification of Biblical localities, especially of Mount Sinai (1874). His chief works are *The Sources of the Nile* (1860), a plea for the opening up of Africa, and *Discoveries of Sinai in Arabia, and of Midian*, published posthumously (1878).

Bekes, bā'kāsh, town, Hungary, in the county of Bekes, near the junction of the Black and White Körös, 105 miles southeast of Budapest. Cattle raising, wine making, and bee keeping are the chief industries. Linen and hemp fabrics are manufactured. Pop. (1920) 46,679, mostly Protestants.

Bekker, bek'er, ELISABETH (1738–1804), Dutch novelist and poetess, wrote, in conjunction with Agatha Deken, what are practically the first modern Dutch novels—*Historie van Mejuffrouw Sara Burgerhart* (1782; 7th ed. 1886), *Historie van den Heer Willem Leevend* (1784–5), *Brieven van Abraham Blankaart* (1787–89), *Cornelia Wildschut* (1793–6) — long-winded moral works in the style of Richardson, but written in easy, natural language. She also wrote semi-satirical sketches of contemporary life—*e.g. De Menuet en de Dominées-Pruik* — besides some dull philosophic poems.

Bekker, IMMANUEL (1785–1871), German philologist, was born in Berlin, where he became professor of philology in 1810. He is best known by his editions of the classics, including *Homer* (1858), *Plato* (1816–23), *Attic Orators* (1822–24), *Thucydides* (1821–32), *Aristophanes* (1829), and *Aristotle* (1831), the text of which he rectified from manuscripts in the chief libraries of Europe.

Bel, title of the principal Babylonian deity, signifying, like Baal, 'owner' or 'lord.' See BABYLONIA.

Bela, bā'lo, the name of several Hungarian kings of the Arpad dynasty. BELA I. deposed his brother Andrew I. in 1060. A strong ruler, he introduced many reforms, and suppressed the last pagan rising. BELA III. (d. 1196) succeeded his brother, Stephen III., in 1174. He was a brother-in-law of Philip Augustus of France. His reign of twenty-two years was signalized by wars with the Poles and Austrians, and the recovery of Dalmatia from the Venetians. BELA IV. ascended the throne in 1235, and six years later was driven from it by the Mongols under Batu Khan. He sought refuge in Austria, but regained his throne in 1244 and reigned until 1270. He was one of the greatest kings of Hungary.

Bel and the Dragon, a book of the Apocrypha, consisting of two legends setting forth the wisdom of the prophet Daniel. In the Septuagint and other translations of the Bible they are attached (like the Song of the Three Holy Children and Susanna) to the canonical book of Daniel. In the first legend Daniel outwits the priests of Bel (q. v.), the chief Babylonian deity; in the second he procures the death of a huge sacred dragon, for which presumptuous deed the populace compel the king of Babylon to cast him into the den of lions, where, however, he is miraculously preserved, and fed with provisions brought by the prophet Habakkuk from Judæa. It is probable that the original language of the book was Aramaic, but it is not known when it was appended to the Greek version of Daniel. See APOCRYPHA.

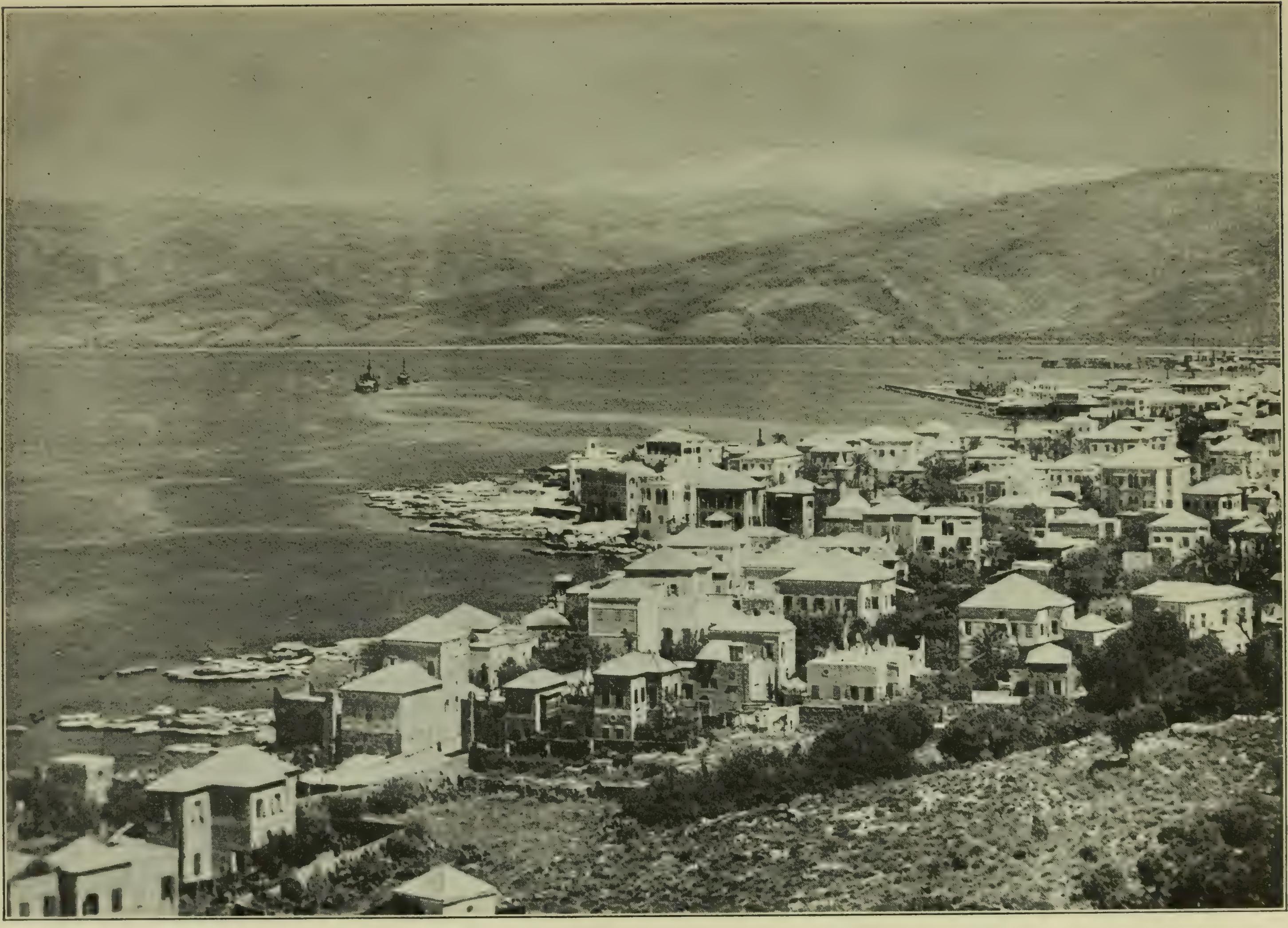
Belasco, DAVID (1853–), American dramatist, was born in San Francisco, Calif. He was graduated from Lincoln College, California, in 1875, was stage manager at several San Francisco theatres (1879–81), and at the Madison Square Theatre, New York (1881), and in 1886 became manager of the Lyceum Theatre. Nine years later he established Belasco's Theatre in the same city, and was manager of E. H. Sothern, Mrs. Leslie Carter, David Warfield, and Blanche Bates. Belasco's first success as a playwright was with *May Blossom* (1884). This was followed by *Lord Chumley, Men and Women, The Charity Ball, The Wife* (all with H. C. de Mille); *The Girl I Left Behind Me* (1893, with Franklin Fyles); *The Heart of Maryland* (1895); *Zaza* (adaptation 1896); *Naughty Anthony* (1899); *Madame Butterfly* (1900; founded on the story of the same name by John Luther Long); *Kitty Bellairs* (1903); *Adrea* (1904; with John Luther Long); *The Girl of the Golden West* (1905); *The Return of Peter Grimm* (1911); *Van der Decken* (1915); *The Son-Daughter* (1919, with George Scarborough); *Kiki* (1921, an adaptation). Because of his ability in training artists, and his genius in stage and lighting effects, Belasco has become better known in later years as a producer of plays.

Belbeis, bel-bās' (anc. *Bubastis Agria*), town in Lower Egypt, 28 miles northeast of Cairo and 13 miles southeast of Zagazig, on the trade route from Syria. It was occupied by Napoleon in 1798. Pop. (1917) 15,624.

Belch'er, SIR EDWARD (1799–1877), British admiral and explorer, was present at the bombardment of Algiers in 1816. In 1825 he went with Captain F. M. Beechey, in the *Blossom*, to Bering Strait, and in 1829 was promoted to be commander. In 1836 he was appointed to the command of the *Sulphur*, and for three years was employed in surveying the west coast of the United States. Returning by the western route, he served in the naval operations against the Chinese in 1841. He was appointed in 1852 to command an Arctic expedition sent in search of Sir John Franklin (q. v.). He became an admiral in 1872. Among his works are *Narrative of a Voyage round the World in H.M.S. 'Sulphur' in 1834–42* (1843), and a treatise on nautical surveying.

Belcher, JONATHAN (1681–1757), American colonial governor, was born in Cambridge, Mass., son of a member of the provincial council. He was graduated (1699) from Harvard, and thereafter passed several years in Europe, making the acquaintance of the future George I. Returning to Boston, he became a merchant, and in 1730 was appointed governor of Massachusetts and New Hampshire, holding the position until a dispute concerning his salary brought about his dismissal in 1741. He was able to vindicate himself, and in 1747 was appointed governor of New Jersey, where he contributed to the stability of the colony's affairs, and was a notable benefactor of the College of New Jersey (Princeton).

Bel'ding, city, Michigan, Ionia county, on the Flat River, and on the Pere Marquette Railroad; 35 miles northeast of Grand Rapids. Manufactures include silk, baskets, refrigerators, and foundry products. Pop. (1910) 4,119; (1920) 3,911.

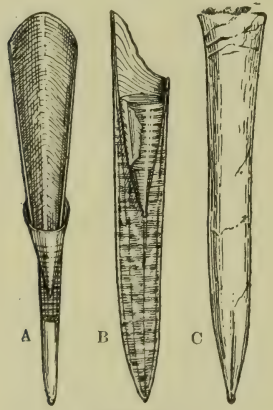


BEIRUT, SYRIA
View of the Harbor, from the American College

Belem, city, Brazil. See PARA.

Belem, a suburb of Lisbon, Portugal. See LISBON.

Belemnites, bel'em-nīts (Gr. *belemnon*, 'a dart' or 'arrow'), an interesting genus of fossil cephalopodous Mollusca, the type of a family called Belemnitidæ or Belemnites, and closely allied to the cuttle family. No recent species is known. Fossil species, which are numerous, are found in all the Jurassic and Cretaceous strata. The remains are generally those of the shell alone, which was entirely internal and double, consisting of a conical chambered portion (the *phragmacone*), inserted into a longer, solid, pointed sheath, termed the *rostrum* or *guard*. The body was furnished with lateral fins, and had eight arms and two longer tentacles. The suckers were provided with horny hooks which probably were used to secure prey. Horny mandibles and remains of an ink-bag have been found, but these are rarely preserved, the part most commonly met being the solid *guard*. From their form belemnites have received such popular names as arrowheads, petrified fingers, picks, and thunder-bolts. They vary from one to fifteen inches in length.



Belemnite

A. Restoration of a belemnite shell (after Zittel). B. Vertical section of a belemnite. C. Belemnite shell.

Belfast, bel-fȧst', seaport, Ireland, capital of Ulster, and a parliamentary and municipal borough in counties Antrim and Down, situated on the river Lagan at the head of Belfast Lough; 113 miles north of Dublin. The river is crossed here by four bridges, of which Queens, opened in 1841, is perhaps the most notable. The finest street of the city is Royal Avenue, on which are many of the better shops and hotels. The principal public parks are Ormean Park and the Botanic Gardens. Noteworthy edifices are the City Hall, erected in 1906 on the site of the old Linen Hall, the Post Office, Library, Belfast Museum, St. Anne's Cathedral (P. E.), St. Peter's Church (R. C.), Carlisle Memorial Church, Ulster Bank, and Custom House. Educational institutions include Queen's College, Methodist College, Presbyterian Theological College, Municipal Technical Institute, and Campbell College (for boys).

Belfast is an important manufacturing and commercial town. In its shipyards, some of the largest ships afloat, as the *Cedric, Baltic, Olympic* and *Titanic*, have been constructed. The chief manufactured products are linen, chemicals, machinery, sails, ropes, damasks, flax, aerated waters, and boots and shoes.

The harbor, which is safe and commodious, is provided with extensive docks and quays. The Alexandra dock, 850 feet long and 100 feet wide, and the graving dock constructed in 1903–10 are among the largest in the world. Inland trade is facilitated by a canal connecting the Lagan with Lough Heagh. Exports include linen, whiskey, iron, sheep, pigs, and potatoes; imports are grain, timber, coal, linen and flax yarn, sugar, and petroleum. Pop. (1911) 386,947.

In 1177 a castle was erected on the site of Belfast. In 1315 Edward Bruce landed here and, aided by Irish chiefs, destroyed the town and castle. In 1604 the castle was granted to Sir Arthur Chichester, who was really the founder of Belfast. It was incorporated as a municipality in 1613, as a city in 1888.

Belfast, seaport city, Maine, county seat of Waldo county, on Penobscot Bay, and the Maine Central Railroad, of which it is a terminus; 85 miles northeast of Portland. The chief public buildings are the Free Library, the Odd Fellows' Hall, and the Masonic Temple. A deep, spacious harbor adds to the city's importance as a seaport, and it has a good shipbuilding trade. Iron, boots and shoes, sashes, and doors are manufactured. Pop. (1910) 4,618; (1920) 5,083.

Belfast Lough, deep and picturesque arm of the sea (14 miles long by 6 miles broad), between counties Antrim and Down, province of Ulster, Ireland. It is generally free from rocks, the only dangerous reef being the Briggs or the Clachan (north side). Near Belfast is Queen's Island (shipbuilding yards), connected with the mainland.

Belfort, bel-fôr', town France, capital of the Territory of Belfort and a fortress of the first class; 171 miles southeast of Troyes. It is of strategical importance, as it commands the passage between the Jura and the Vosges, known as the Trouée de Belfort. The citadel, on the summit of a rock 220 feet high, before which stands the colossal 'Lion of Belfort' commemorating the defence of 1870–71, is the chief point of interest. Important buildings are the Palais de Justice, the Church of St. Christopher, the Hôtel de Ville, the Library and Museum. Textiles, clocks, hats, iron wire, and wine are manufactured, and there is trade in grain and liquors. Pop. (1921) 39,301.

Belfort was founded about the 11th century. It was taken by the Swedes in 1632 and in 1634, and was ceded in 1648 to France. In 1814–15 it successfully withstood the Allies. In the Franco-German War it was besieged by the Germans. A fierce engagement took place outside its walls on Jan. 15–17, 1871; and on Feb. 18 the garrison capitulated, and were permitted to march out with full honors of war.

Belfort, TERRITORY OF, small district (235 square miles) on the eastern frontier of France, forming the remnant of the former department of Haut-Rhin, ceded to Germany in 1871. It drains to the Saône. The land under irrigation yields good crops, and the meadow lands are rich. Iron and cotton and woolen goods are manufactured. Pop. (1921) 94,338.

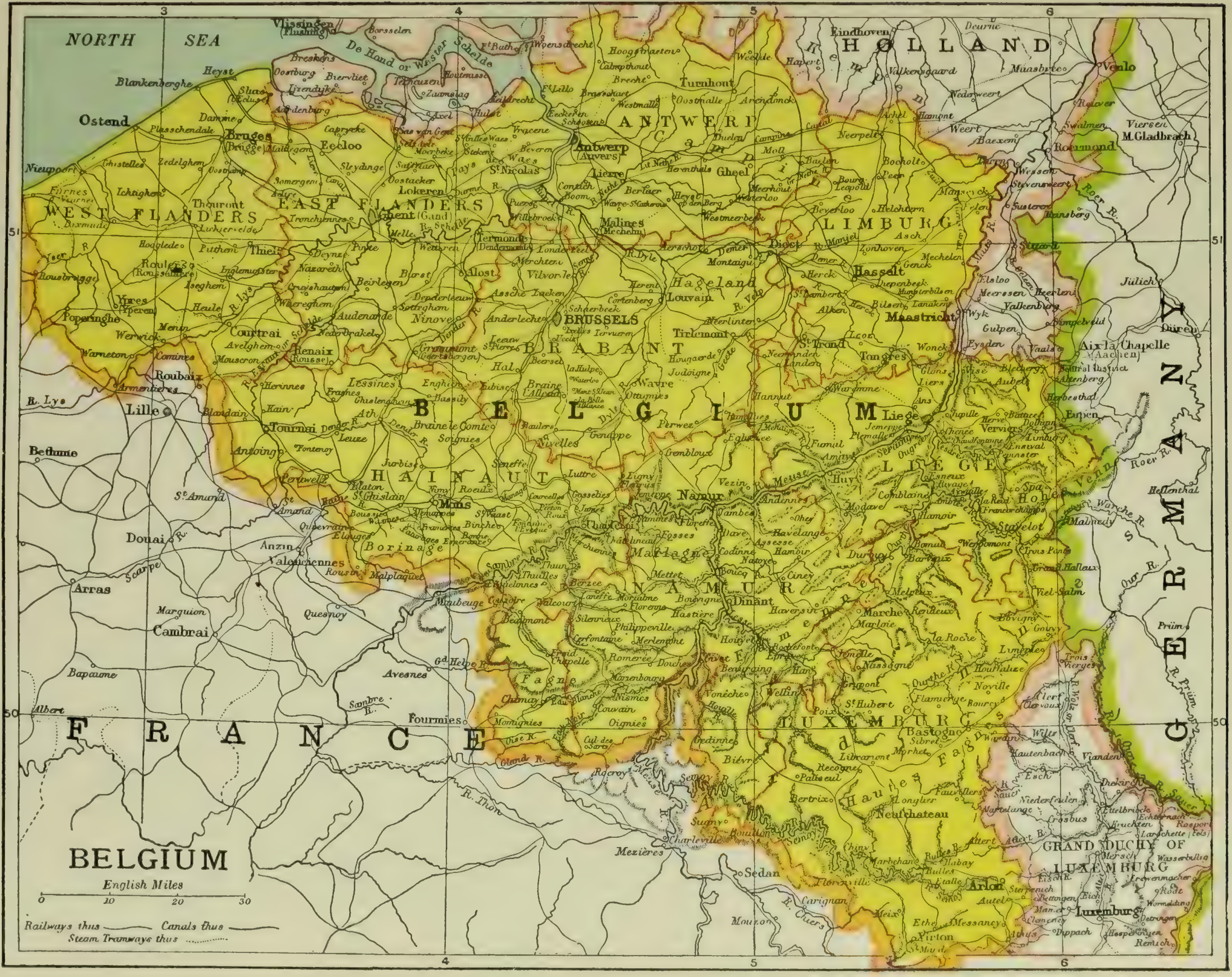
Bel'fry, in its modern sense, a bell-tower, and, in a more restricted sense, the chamber of a tower in which the bells are hung. Originally it was applied to the wooden tower on wheels which was used by besiegers in attacking a castle, and occasionally to a stationary pent-house, under cover of which the attacking force shot their missiles, and from the upper story stormed the ramparts. See BELL; CAMPANILE.

Belgæ, bel'jē, a nation of Germanic origin, who dwelt in the northeast of Gaul, between the Rhine, the English Channel, and the Seine. Cæsar subdued them after prolonged resistance.

Belgaum, bel-gä'o͞om, chief town in the district of the same name, Bombay Presidency, India. It consists of a town, fort, and military cantonment situated in a plain about 2,500 feet above the sea. There are a fort church, containing memorials to the heroes of the Kolhapur insurrection, a mosque, two Jain temples, and several schools. Pop. 36,000.

Belgian Congo. See CONGO, BELGIAN.

Belgiojoso, bel-jō-yō'sō, CRISTINA, PRINCESS OF (1808–71), Italian writer and patriot, was born in Milan, where she also died. She married in 1824


BELGIUM
English Miles
0 10 20 30
Railways thus
Canals thus
Steam Tramways thus
NORTH SEA
HOLLAND
GERMANY
FRANCE
BELGIUM
WEST FLANDERS
EAST FLANDERS
ANTWERP
LIMBURG
BRABANT
HAINAUT
NAMUR
LIEGE
LUXEMBURG
GRAND DUCHY OF LUXEMBURG
Ostend
Bruges
Ghent (Gand)
Antwerp (Anvers)
Malines (Mechelen)
BRUSSELS
Louvain
Hasselt
Maastricht
Liege
Namur
Mons
Tournai
Courtrai
Ypres (Yperen)
Dinant
Arlon
Luxemburg
Lille
Roubaix
Valenciennes
Douai
Arras
Cambrai
Aix la Chapelle (Aachen)
Vlissingen (Flushing)
Venlo
Sedan
Mezieres
3
4
5
6
51
50

to Prince Belgiojoso—an unhappy union. Full of enthusiasm for the liberty of Italy, in 1848 she equipped at her own cost a regiment of volunteers. Upon the failure of the rising she retired to the Orient, where she remained until 1855, when her confiscated estates were restored her. After a short stay in Italy she again went, in 1858, to Paris, where she worked energetically for the plans of Cavour. In 1861 she returned to Italy to found the periodicals *Italia* and *Perseveranza*. A little later she became the friend of the house of Savoy. She wrote ***Essai sur la Formation du Dogme Catholique*** (4 vols. 1842–3), ***Souvenirs d'Exil*** (1859), ***Emina: Récits Turco-Asiatiques*** (2 vols. 1856), ***Scenes de la Vie Turque*** (1858). ***Historie de la Maison de Savoie*** (1860), etc.

Belgium, bel'ji-um, a small country of Western Europe, formerly a part of the Low Countries or the Netherlands (q. v.), bounded on the north by the North Sea and Holland, on the east by Holland, Prussia, and Luxemburg, on the west and south by France. The total area is about 11,373 square miles; the greatest length from northwest to southwest, 173 miles; the greatest breadth from north to south, 105 miles; the coast line 42 miles.

Topography.—The surface of Belgium slopes from the southeast to the North Sea, and is drained by the Scheldt and the Meuse (Maas) and their numerous tributaries, of which the most important is the Sambre. The Sambre-Meuse line divides the country into two main physiographic regions. To the south is a roughly triangular area consisting of a series of plateaus, trenched by ravines and narrow valleys, belonging mostly to the system of the Ardennes (q. v.), and including marsh and moor land and heavily wooded slopes. North of the line the surface is nearly a level plain, made exceptionally fertile by the unremitting labors of generations. It includes the Campine, formerly a barren tract of sand, stretching across the provinces of Antwerp, Limburg, and Brabant, which has been largely reclaimed, since the middle of the nineteenth century, by spade labor and heavy manuring; and the low coast lands of West Flanders, protected by artificial embankments from the inundations of the sea.

Climate.—The climate is generally temperate. In the plains near the sea it is cool, humid, and somewhat unhealthy; in the higher districts in the southeast, hot summers alternate with very cold winters. The rainfall ranges from 27.5 inches in the west to 40 inches in the district east of the Meuse.

Geology.—The geological formations of Belgium are closely associated with those of France and England. The greater portion of the country is covered with *Tertiary deposits* in which the different geological periods are fully represented, though only the second, containing the Pliocene deposits, is rich in fossils. *Secondary deposits* occupy an extensive tract in Central Belgium, between the Scheldt and the Demer. The most important district, economically, is the southwest, consisting of *Paleozoic rocks*—Silurian, Devonian, and Carboniferous.

Mineral Products are abundant and constitute an important source of the country's prosperity—coal, iron, copper, zinc, lead, alum, manganese, marble, slate, and limestone being found within its borders. Coal deposits are said to underlie about a twentieth of the total area; the annual output of coal under normal conditions is about 24,000,000 tons; and the mines give employment to more than 150,000 people. The produce of the iron mines is valued at $13,000,000 annually, and the principal seats of the industry are Charleroi and Liège. The production, however, even before the Great War, was less than in former years, iron being imported in considerable quantities from France. Lead and zinc are worked in Liège, copper in Hainault and Liège, manganese in Liège and Namur, black marble at Dinant, slate at Herbeumont, and calamine (zinc) at Liège.

Manufactures. — Manufacturing ranks with mining as one of Belgium's most important industries, cheap and abundant fuel being a great incentive. The principal manufactured products are textiles (linens, woollens, cotton, and silk), lace, leather, and metals.

The great seats of the linen industry, the oldest in Belgium, are in Flanders. Lace manufacture is also largely Flemish, and though it has declined in recent years still gives employment to thousands of workers. Woollen centres are Ypres, Ghent, Tournay, and especially Verviers. Brussels and Louvain have large carpet manufactures, and Hainault supplies a considerable amount of hosiery. The principal seat of the cotton trade is Ghent, where the industry was first established in 1798. Belgian leather has a good reputation, and the manufacture of gloves has made great progress in recent years. Metallurgy also has rapidly increased in productiveness since 1816, when Cockerill introduced into Belgium the English method of smelting iron with coke. The principal seats of metal manufacture are Liège, Ghent, Charleroi, Mons, and their neighborhoods. Machinery is manufactured at Brussels and Seraing. There are large ordnance foundries at Liège and Antwerp, and celebrated makers of firearms in Liège; nail-making at Charleroi; manufactures of copper at Malines, and of tinware at Liège; wire and brass factories at Namur, Liège and Brussels; zinc manufactures at Liège; and lead and shot factories at Ghent. Gold and silver goods are manufactured at Brussels, Liège, and Antwerp; glass and porcelain at Tournai, Brussels, Courcelles, Charleroi, Namur, and Liège. Other industries include the manufacture of sugar, paper, and furniture, brewing, and distilling.

Belgium's manufacturing interests suffered heavily during the Great War (1914–19), the German government from the beginning systematically stripping the factories of machinery and tools with the purpose not only of crippling industry as a war measure, but as an ecomomic means of preventing future competition. While the armistice terms require the return of all industrial equipment, the lack of raw materials and the general disorganization of industry constitute serious handicaps to a return to pre-war conditions.

Agriculture and Stockraising.—Compared with mining and manufacturing, agriculture is of somewhat minor importance, and a constantly diminishing number of people are engaging in it. The large majority of the farmers are small holders, owning only about 2½ acres of land, but under the intensive system of cultivation these small farms yield a maximum of produce. An agricultural commission in each province looks after the interests of the farmer, gives counsel, and encourages improvements. The Ardennes districts yield a large supply of wood, and their forests abound in game; while the level provinces raise all kinds of grain—wheat, rye, oats, and barley—leguminous plants, hemp, flax, colza, tobacco, hops, dyeplants, and chicory. Beets are extensively cultivated both for sugar and for fodder.

The acreage and production of the principal crops in 1913, the year preceding the outbreak of the Great War and the vast devastation wrought by the German invaders, was as follows: Oats, 679,235 acres, 1,559,251,680 pounds; rye, 648,727 acres, 1,278,132,576 pounds; wheat, 398,735 acres, 900,369,120 pounds; potatoes, 379,677 acres, 3,200,932 tons; sugar beets, 131,047 acres, 1,391,917 tons; barley, 85,082 acres, 205,650,592 pounds.

Industries akin to agriculture are stockraising, dairying, and viniculture. Cattle, hogs, sheep, and horses are bred, and animals and animal products form an important item of export. Cheese is produced for both domestic and foreign consumption. Grapes are grown in the valley of the Meuse.

Commerce.—In 1913, prior to the German invasion, the foreign trade of Belgium amounted to $1,753,134,600; the imports for home consumption being valued at $1,009,971,800 and the exports at $743,162,800. There was also a large transit trade amounting to $591,985,000. The chief articles of export were wool, valued at $70,099,000; iron and steel, $50,263,000; flax, $26,564,600; flax yarns, $22,880,400; raw hides, $22,476,800; and rubber, $21,849,800. Imports include cereals, cotton, wool, hides, seeds, and rubber.

The great bulk of the trade was formerly with Germany, the latest pre-war statistics (1912) showing the following distribution of exports and imports: Germany, $201,493,800 exports, $140,624,000 imports; France, $150,462,800 exports, $181,609,600 imports; Great Britain and Ireland, $118,925,000 exports, $101,129,200 imports; Netherlands, $73,519,800 exports, $71,314,600 imports; United States, $29,025,600 exports, $82,765,800 imports.

Communications.—In 1913 there were in Belgium 2,926 miles of railroads, of which 2,709 miles were operated by the state; 1,360 miles of navigable waterways; 6,000 miles of roads; and an extensive system of canals. The roads were generally excellent, and there were electric and steam tramways in the principal cities. There were also nearly 5,000 miles of public telegraph lines and over 260 urban telephone systems, all under state management. In 1919 transportation facilities were demoralized. The Germans in their retreat had destroyed 690 miles of railway and rendered useless 260 miles, beside commandeering large numbers of locomotives, passenger coaches and freight cars, wrecking bridges, and destroying telephone and telegraph systems.

Population.—The population in 1913 was estimated at 7,571,387, or 665 persons per square mile, making Belgium one of the most densely populated countries in Europe.

The people consist of two races, the Flemings and Walloons, with small numbers of Germans, French, and Dutch. The Flemings (q. v.), generally blond, ponderous, and phlegmatic, obviously of Teutonic origin, make up some five-eighths of the population, living chiefly in Flanders, Antwerp, Limburg, and Brabant. The Walloons (q. v.), dark, active, and vivacious, are of Celtic origin. They dwell chiefly in the Ardennes region. The Flemings and Walloons have each their peculiar dialect but the French language has gained the ascendency in educated society and in the offices of the government.

The principal cities are: Brussels the capital, with a population (1913) of 663,647; Antwerp, 312,884; Liège, 170,634; Ghent, 167,477; Mechlin, (Malines) 59,735.

Religion.—The Roman Catholic is the dominant religion, although full liberty of worship is guaranteed to all, and grants are made by the state to ministers of all denominations. Protestants number only 15,000, Jews 3,000.

Education.—Primary education is largely under communal control and is supported by communal taxation, supplemented by state and provincial subsidies. Each commune has at least one primary school—frequently a private institution taken over by local authorities and adapted to the requirements of the parish. Middle Schools are of two kinds—Upper and Lower. Upper Middle Schools usually receive boys only, but Lower Middle Schools, including industrial and commercial schools, are maintained for both boys and girls. There are also many private schools, chiefly under ecclesiastical direction. Higher education is provided for by universities at Louvain, Brussels, Ghent, and Liège—the two latter maintained by the state.

Army.—The Belgian army, the organization of which was established by a law of 1873, was intended solely for defence and to preserve the neutrality of the country. It is recruited by voluntary enlistment and by conscription, decided by lot, and the purchase of substitutes is allowed. The period of service is eight years, five of which are generally passed on furlough or in the reserve. The peace strength is 51,000 men; the regular war strength 150,000. Besides the regular army there is a *Garde Civique* of 40,000 men which may be raised to 130,000.

During the Great War voluntary enlistment greatly increased and compulsory service was extended, bringing the mobilized strength to 267,000 at the signing of the Armistice. Casualties sustained during the war were placed at 90,000, including 20,000 dead, 60,000 wounded, and 10,000 prisoners and missing. The country has no navy.

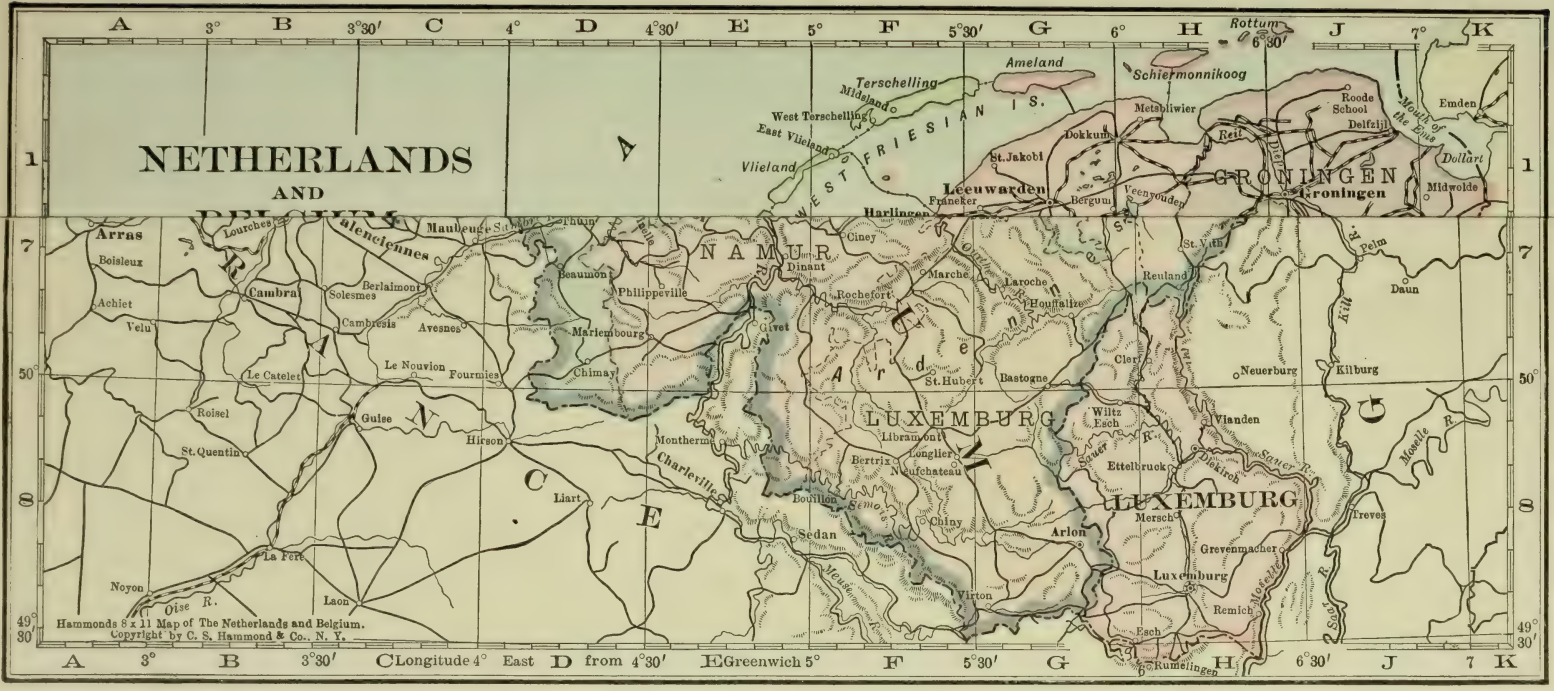
Government.—The government of Belgium is a limited constitutional and hereditary monarchy, established in its present form in 1830. The legislative power is vested in the King, the Senate, and the Chamber of Deputies. The Senate, or Upper House, is composed of 120 members, part of whom are chosen by direct vote, part by the provincial councils. Members of the Lower House are elected directly by the people on the basis of population. The executive power is vested in the king and a responsible ministry.

Universal male suffrage obtains and failure to vote is a misdemeanor. Plural voting up to three votes, according to property or educational qualifications, was formerly in force but was discontinued by the Electoral Reform Bill enacted early in 1919, which also extended the franchise to widows who have not remarried and to mothers of soldiers killed in battle or of civilians shot by Germans.

For administrative purposes the kingdom is divided into nine provinces, which are subdivided into cantons and communes. Each province has a governor appointed by the king and a provincial council elected by popular vote, with jurisdiction in all provincial matters not provided for in the general administration.

Finance.—In 1913 the total state revenue amounted to $161,557,600; the total expenditures to $185,703,800. On Jan. 1, 1914, the debt stood at $748,605,487. The greater part of this debt was incurred for public works and the interest is normally more than covered by the revenue from railways. Under the German *régime* the estimated revenue for 1916 was $49,729,987 and the expenditures $54,896,908—a deficit of $5,166,100. The monetary unit is the franc.

History.—The history of Belgium as an independent kingdom commences in 1830, when it separated from Holland (see NETHERLANDS). The union of what had been the Spanish or Austrian Netherlands to Holland in 1815 was from the first an arbitrary one, as the people of



Hammonds 8 x 11 Map of The Netherlands and Belgium.
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BELGIUM

PROVINCES

Antwerp	E 5
Brabant	E 6
East Flanders	C 6
Hainaut	C 6
Liege	G 6
Limburg	F 5
Luxemburg	F 8
Namur	E 7
West Flanders	B 6

Thielt	B 5
Thourout	B 5
Tirlemont	E 6
Tongres	G 6
Tournay	B 6
Turnhout	E 5
Uccle	D 6
Verviers	G 6
Vilvorde	D 6
Wasmes	C 7
Wervicq	A 6
Wetteren	C 6
Willebroeck	D 5
Ypres	A 6
Zele	D 5

LUXEMBURG

CITIES-TOWNS

Clerf	G 7
Diekirch	H 8
Echternach	H 8
Esch	G 8
Ettelbruck	G 8
Grevenmacher	H 8
Luxemburg	H 8
Mersch	H 8
Remich	H 8
Vianden	H 8
Wiltz	G 8

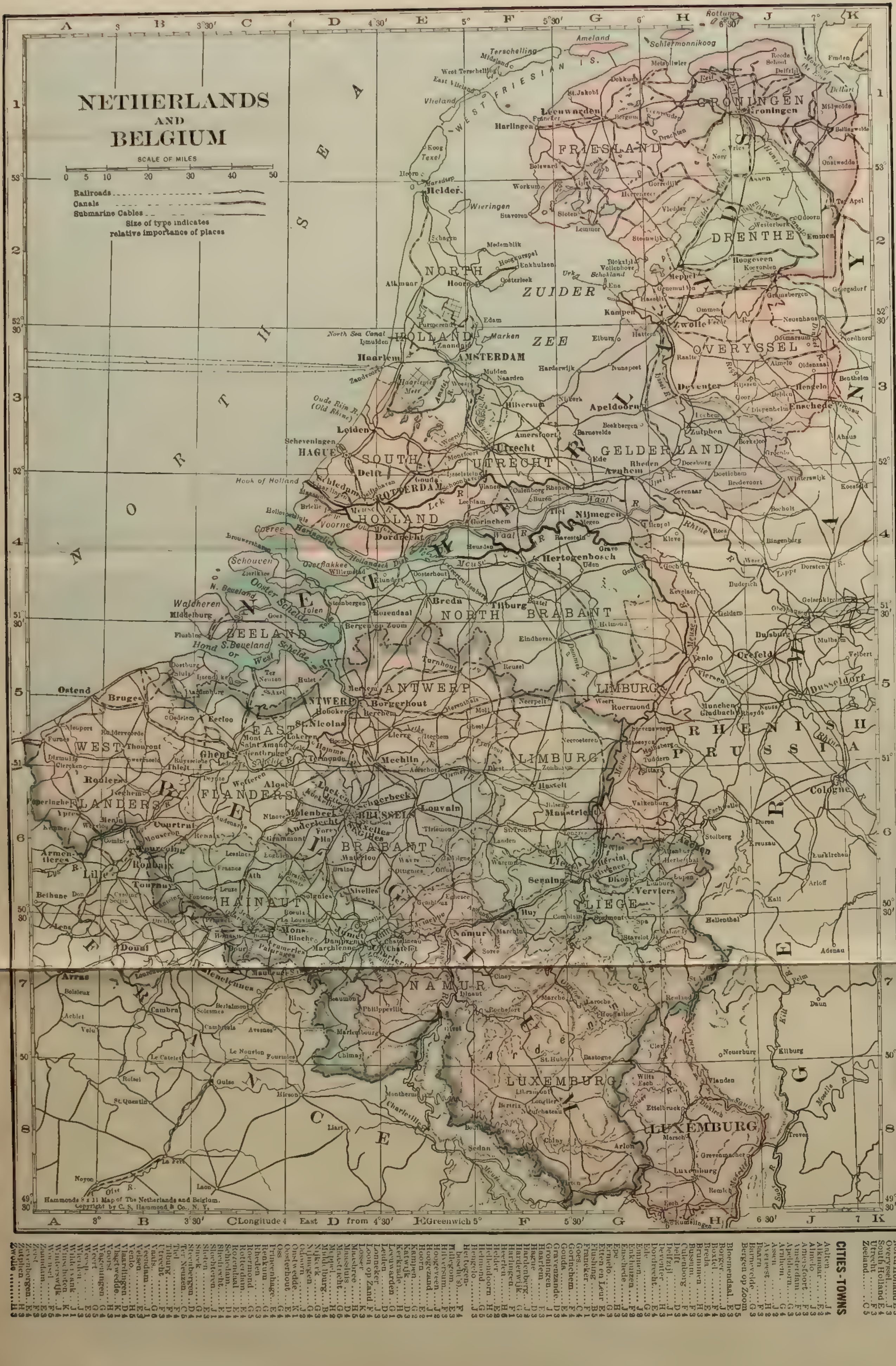
NETHERLANDS

PROVINCES

Drenthe	J 2
Friesland	G 1
Gelderland	H 3
Groningen	J 1
Limburg	G 5
North Brabant	F 4
North Holland	E 3
Overyssel	J 3
South Holland	E 4
Utrecht	F 3
Zeeland	C 5

CITIES-TOWNS

Aalten	J 4
Alkmaar	E 2
Almelo	J 3
Amersfoort	F 3
Amsterdam	F 3
Apeldoorn	G 3
Arnhem	G 4
Assen	J 2
Avereest	H 2
Baarn	F 3
Barneveld	G 3
Bergen op Zoom	D 5
Bloemendaal	E 3
Borger	J 2
Boxtel	F 4
Breda	E 4
Brummen	H 3
Bussum	F 3
Culenborg	F 4
Delft	D 3
Delfzijl	J 1
Deventer	H 3
Dordrecht	E 4
Ede	G 3
Emmen	J 2
Enkhuizen	F 2
Enschede	J 3
Epe	H 3
Ermelo	G 3
Etten en Leur	E 4
Flushing	B 5
Franeker	F 1
Goes	C 4
Gorinchem	F 4
Gouda	E 4
Gravenzande	D 3
Groningen	J 1
Haarlem	E 3
Hague	D 3
Hardenberg	J 2
Harderwijk	G 3
Harlingen	F 1
Heerlen	H 6
Helder	E 2
Hellendoorn	H 3
Helmond	G 5
Hengelo	J 3
Hertogenbosch('s)	F 4
Hillegom	E 3
Hilversum	F 3
Hoogeveen	J 2
Hoogezand	J 1
Hoorn	E 2
Kampen	G 2
Katwijk	D 3
Kerkrade	H 6
Leeuwarden	G 1
Leiden	D 3
Lonneker	J 3
Loon op Zand	F 4
Losser	K 3
Maasbree	H 5
Maassluis	D 4
Maastricht	G 6
Meppel	H 2
Middelburg	B 4
Nijkerk	G 3
Nijmegen	G 4
Odoorn	J 2
Onstwedde	K 1
Oosterhout	E 4
Oss	G 4
Princenhage	E 4
Renkum	G 4
Rheden	G 3
Roermond	G 5
Rotterdam	E 4
Rozendaal	E 4
Schiedam	D 4
Sliedrecht	E 4
Slochteren	J 1
Sloten	E 3
Sneek	G 1
Steenbergen	D 4
Ter Neuzen	C 5
Tiel	F 4
Tilburg	F 4
Utrecht	F 3
Vaals	G 6
Veendam	J 1
Velsen	E 3
Venlo	H 5
Vlaardingen	D 4
Vlagtwedde	K 1
Voorst	H 3
Wageningen	G 4
Weert	G 5
Weesp	E 3
Wierden	J 3
Wildervank	J 1
Winschoten	K 1
Winterswijk	J 4
Woensel	F 5
Zaandam	E 3
Zeist	F 3
Zevenbergen	E 4
Zutphen	H 3
Zwolle	H 3



BELGIUM

PROVINCES

Antwerp	E5
Brabant	E6
East Flanders	C6
Hainaut	C6
Liege	G6
Limburg	F5
Luxemburg	F8
Namur	E7
West Flanders	B6

CITIES-TOWNS

Alost	C6
Anderlecht	D6
Anderlues	D7
Angleur	G6
Ans	G6
Antwerp	D5
Arlon	G8
Ath	C6
Berchem	E5
Beveren	D5
Binche	D7
Boom	D5
Borgerhout	E5
Boussu	C7
Braine le Comte	D6
Bruges	B5
Brussels	E6
Charleroi	E7
Chatelet	E7
Chatelineau	E7
Chenee	G6
Couillet	E7
Courcelles	D7
Courtrai	B6
Cuesmes	C7
Dampremy	D7
Deurne	D5
Dison	G6
Dour	C7
Eecloo	C5
Etterbeek	D6
Farciennes	E7
Forest	D6
Frameries	D7
Gentbrugge	C5
Gheel	F5
Ghent	C5
Gilly	E7
Gosselies	D7
Grammont	C6
Grivegnee	G6
Hal	D6
Hamme	D5
Hasselt	F6
Herstal	G6
Hoboken	D5
Hornu	C7
Huy	F6
Iseghem	B6
Ixelles	D6
Jemappes	C7
Jemeppe	G6
Jette	D6
Jumet	D7
Kessel Loo	E6
Koekelberg	D6
Laeken	D6
La Louviere	D7
Ledeberg	C5
Lessines	C6
Liege	F6
Lierre	E5
Lodelinsart	D7
Lokeren	D5
Louvain	E6
Maldegem	B5
Marchienne au Pont	D7
Marcinelle	D7
Mechlin	E5
Menin	B6
Merxem	D5
Meulebeke	B6
Molenbeek St. Jean	D6
Moll	F5
Monceau sur Sambre	D7
Mons	D7
Montegnee	G6
Montignies sur Sambre	D7
Mont Saint Amand	C5
Mouscron	B6
Namur	E7
Nivelles	D6
Ostend	A5
Ougree	G6
Paturages	C7
Peruwelz	C7
Poperinghe	A6
Quaregnon	C7
Ransart	D7
Renaix	C6
Roulers	B6
Roux	D7
Saint Gilles	D6
Saint Josse ten Noode	D6
Saint Nicolas	D5
Saint Nicolas	G6
Saint Trond	F6
Schaerbeek	E6
Seraing	F6
Soignies	D6
Tamise	D5
Termonde	D5
Thielt	B5
Thourout	B5
Tirlemont	E6
Tongres	G6
Tournay	B6
Turnhout	E5
Uccle	D6
Verviers	G6
Vilvorde	D6
Wasmes	C7
Wervicq	A6
Wetteren	C6
Willebroeck	D5
Ypres	A6
Zele	D5

LUXEMBURG

CITIES-TOWNS

Clerf	G7
Diekirch	H8
Echternach	H8
Esch	G8
Ettelbruck	G8
Grevenmacher	H8
Luxemburg	H8
Mersch	H8
Remich	H8
Vianden	H8
Wiltz	G8

NETHERLANDS

PROVINCES

Drenthe	J2
Friesland	G1
Gelderland	H3
Groningen	J1
Limburg	G5
North Brabant	F4
North Holland	E3
Overyssel	J3
South Holland	E4
Utrecht	F3
Zeeland	C5

CITIES-TOWNS

Aalten	J4
Alkmaar	E2
Almelo	J3
Amersfoort	F3
Amsterdam	F3
Apeldoorn	G3
Arnhem	G4
Assen	J2
Avereest	H2
Baarn	F3
Barneveld	G3
Bergen op Zoom	D5
Bloemendaal	E3
Borger	J2
Boxtel	F4
Breda	E4
Brummen	H3
Bussum	F3
Culenborg	F4
Delft	D3
Delfzijl	J1
Deventer	H3
Dordrecht	E4
Ede	G3
Emmen	J2
Enkhuizen	F2
Enschede	J3
Epe	H3
Ermelo	G3
Etten en Leur	E4
Flushing	B5
Franeker	F1
Goes	C4
Gorinchem	F4
Gouda	E4
Gravenzande	D3
Groningen	J1
Haarlem	E3
Hague	D3
Hardenberg	J3
Harderwijk	G3
Harlingen	F1
Heerlen	H6
Helder	E2
Hellendoorn	H3
Helmond	G5
Hengelo	J3
Hertogenbosch('s)	F4
Hillegom	E3
Hilversum	F3
Hoogeveen	J2
Hoogezand	J1
Hoorn	E2
Kampen	G2
Katwijk	D3
Kerkrade	H6
Leeuwarden	G1
Leiden	D3
Lonneker	J3
Loon op Zand	F4
Losser	K3
Maasbree	H5
Maassluis	D4
Maastricht	G6
Meppel	H2
Middelburg	B4
Nijkerk	G3
Nijmegen	G4
Odoorn	J2
Onstwedde	K1
Oosterhout	E4
Oss	G4
Princenhage	E4
Renkum	G4
Rheden	G3
Roermond	G5
Rotterdam	E4
Rozendaal	E4
Schiedam	D4
Sliedrecht	E4
Slochteren	J1
Sloten	E3
Sneek	G1
Steenbergen	D4
Ter Neuzen	C5
Tiel	F4
Tilburg	F4
Utrecht	F3
Vaals	G6
Veendam	J1
Velsen	E3
Venlo	H5
Vlaardingen	D4
Vlagtwedde	K1
Voorst	H3
Wageningen	G4
Weert	G5
Weesp	E3
Wierden	J3
Wildervank	J1
Winschoten	K1
Winterswijk	J4
Woensel	F5
Zaandam	E3
Zeist	F3
Zevenbergen	E4
Zutphen	H3
Zwolle	H3

the northern and southern parts of the united kingdom differed essentially in religion, language, interests, and historic feeling.

Under William I., the Belgians had become more and more dissatisfied, and finally, on August 25, 1830, the anniversary of the king's accession, inflamed by the Paris revolution of July (1830), they rose in revolt. After weeks of rioting and fighting, a provisional government was formed; Prince Frederick, the son of the Dutch king, who had attempted to quell the revolt, was compelled to retreat from Brussels to Antwerp, having suffered considerable loss; and on Oct. 4 Belgian independence was declared. The crown was offered to Leopold of Saxe-Coburg, husband of Princess Charlotte of England, and he ascended the throne as Leopold I. on June 21, 1831.

Immediately upon the accession of Leopold, the Dutch invaded Belgium and in the ensuing struggle disaster was prevented only by the arrival of aid from France. This intervention alarmed the other powers, especially England, and as a result, the treaty of London (1831), guaranteeing the neutrality of the new kingdon, was signed by the five great powers, King William of Holland reluctantly assenting to the treaty in 1839.

Up to 1840 the Catholic and Liberal parties,which had joined forces in the struggle for independence, remained united. By degrees, however, the more conservative element obtained control and in 1842 succeeded in enacting a law declaring religious instruction compulsory in primary schools and entrusting it to the clergy under state supervision. From this dates the chief political struggle in Belgian history. In the first instance it occasioned the formation of a Liberal alliance (organized by a prominent Freemason named Defacqz), which agitated for extension of the franchise by educational as well as property qualifications, and which gained sufficient hold on the electorate to necessitate the formation of a purely Liberal ministry (with Charles Rogier as premier) in 1847. Under this ministry, many public works of great value were undertaken—railways were extended, and other means of communication were opened up; the question of secondary education was settled; and private industry was encouraged. In 1855 the Catholics returned to power, but in 1857 they were again replaced by the Liberals, who retained control of the government until 1870.

The ultimate cause of the defeat of the Liberal party was the Flemish movement. There had been a literary revival of the Flemish language about 1840, and attempts had been made to put it on a par with French in official use. The Liberals, whose strength lay chiefly in the French-speaking districts, opposed the movement, and at the elections of 1870 Antwerp and Ghent abandoned them, and Clerical ministries succeeded (1870-8). They were successful in raising Flemish to the dignity of an official language, but the demonstrativeness of the Clerical party, at a time when there was a strong anti-Clerical reaction in other Continental countries, led to a considerable Liberal success at the elections of 1878. The resultant Liberal ministry (under Frère-Orban) carried a primary education law which placed the elementary schools under strict state supervision. The bishops protested and organized a rival system of voluntary church schools; diplomatic relations were broken off with the Vatican; the ministry was severely defeated in 1884; and the Catholics again acquired the ascendency, which they have since maintained.

By 1884 Socialism was becoming more and more a force to be reckoned with in Belgian politics, and in 1886 a socialist rising at Liège spread rapidly to other industrial centres. The ministry acted promptly and the outbreak was suppressed by military force but it led to an inquiry into the causes of dissatisfaction, and to a parliamentary consideration of franchise reform. No change was effected, however, until 1893, when a general strike of 50,000 workmen, led to the immediate acceptance of universal manhood suffrage tempered by the plural vote. A second vote was given to fathers of families possessed of a specified amount of property, and a second and third vote to persons with certain educational and professional qualifications. Proportional representation in all parliamentary elections was secured in 1900, and in 1919 plural voting was superseded by pure manhood suffrage.

Other measures of reform passed under Catholic ascendency provided for industrial and labor councils, composed of employers and employees; erection of workmen's dwellings; supervision of the labor of women and children; regulation of workshops; granting of corporate rights to trade unions; guaranteeing security and health of working men during the hours of labor; equality of employee and employer in regard to contracts; free control of their savings by married women; and old age pensions.

In 1885 the Congo Free State was acknowledged by the European powers as an independent state under the presidency of the Belgian king, and in 1908, following serious charges of extortion and cruelty by resident officials, it was annexed to Belgium as the Belgian Congo (q. v.).

King Leopold II., who had followed Leopold I. in 1865, died in 1909, and was succeeded by his nephew, Albert I. (q. v.).

The Great War.—Prior to the outbreak of the Great War the neutrality of Belgium, as guaranteed in 1831 and 1839, was considered an inviolable principle of European law. It had been strictly observed during the Franco-German War by both France and Prussia, and was reaffirmed by France immediately following the outbreak of hostilities in Europe in July, 1914. Germany, however, placing military expediency above all consideration of international honor, demanded of the Belgian government a free passage to France, and upon Belgium's refusal, invaded the country on Aug. 4, forcing the retreat of the gallant Belgian army, whose numbers were too weak for effective resistance, looting and burning houses and villages, and committing unprecedented outrages against the lives and property of the civil population. Liège, the key to the French railway system, fell before the invaders on Aug. 7; Brussels was taken on Aug. 20 three days after the government and the greater part of the army had fled to Antwerp; Namur fell on Aug. 23. From Antwerp the government moved to Ostend and thence to Havre, France, where it was granted extraterritoriality. Antwerp was taken after a stubborn resistance on Oct. 10, and Ostend on Oct. 15. Before the close of 1914 practically all of Belgium was occupied by the enemy. General von Bissing was appointed German military governor and upon his death in April, 1917, was succeeded by Gen von Falkenhausen.

The history of the German *régime* in Belgium is one of systematic spoliation and oppression. Heavy indemnities were imposed on the Belgian cities; thousands of estates were destroyed; vast quantities of machines and machine tools, horses, motors, locomotives, foodstuffs, and raw materials were seized by the German authorities in a systematic attempt to destroy Belgian enterprise; and thousands of Belgian workmen

(100,000 to 300,000) were deported to serve practically as slaves in German industries. Under these conditions famine and destitution were inevitable in spite of the splendid efforts of relief organizations—notably the Commission for Relief in Belgium—under whose auspices the charity of the world was made available for the stricken land (see Belgium, Commission for Relief in).

Organized efforts were made also, to create a lasting division between the Flemings and the Walloons, by reviving and exploiting for German ends the old Flemish movement. Two distinct administrative districts were created (March, 1917), separatist demonstrations were organized by German agents, and a declaration of Flemish independence was actually issued. This movement, however, not only failed to gain any popular adherence, but served rather to affirm the unshakable will of the people to continue unfalteringly their struggle for the integral restoration of Belgium as an independent nation.

By 1916 the Belgian army, reorganized and re-equipped, had taken its place on the Western front. In the great fall offensive of 1918 it co-operated with other Allied units in retaking Ostend, Zeebrugge, and Bruges, in driving the enemy from Flanders, and in bringing Germany to terms which included the evacuation of all the occupied portion of Belgium and France (see Armistice). On Nov. 13, 1918, King Albert re-entered Ghent; on Nov. 19, Antwerp; and on Nov. 22, Brussels.

By the terms of the Peace Treaty Germany was required to consent to the abrogation of the treaty of 1839, by which Belgium was established as a neutral state, and to agree in advance to any convention by which the Allied and associated powers might determine to replace them. She was to recognize also Belgian sovereignty over the contested territory of Moresnet (q. v.) and over part of Prussian Moresnet, and to renounce in favor of Belgium all rights over the circles of Eupen and Malmedy on the Belgian-Prussian frontier, the inhabitants of which were entitled within six months to protest against this change of sovereignty; to give options to Belgium over ten years for delivery of 8,000,000 tons of coal; to repay all sums borrowed by Belgium from her Allies as a result of Germany's violation of the treaty of 1839, up to Nov. 11, 1918; and to restore certain art treasures. By a decision of the Peace Conference announced June 24, 1919, Belgium was granted priority payment of $500,000,000 from the German indemnities.

Bibliography. — Consult C. Smythe's *The Story of Belgium;* Boulger's *A History of Belgium* (2 vols.), and *Belgian Life in Town and Country;* Scudmore's *Belgium and the Belgians;* Rowntree's *Land and Labor: Lessons from Belgium* (1910); Ingpen's *The Glory of Belgium* (1914); Essen's *Short History of Belgium* (1915); Vose's *The Spell of Flanders* (1915); McDonnell's *Belgium, Her Kings, Kingdom and People* (1914); R. C. K. Ensor's *Belgium* (1915); Brand Whitlock's *Belgium* (2 vols., 1919).

Belgium, Commission for Relief in, an international organization formed late in 1914 by the American and Spanish ambassadors in London, the American and Spanish ministers at Brussels, the American ambassador at Berlin, and the American minister at The Hague, to care for civilians in the war-devastated districts of Belgium and Northern France. Headquarters were established in London with branches in New York, Rotterdam, Paris, and Brussels, and Herbert C. Hoover (q. v.) was appointed chairman and director of affairs in Belgium. The original idea of the commission was to depend upon a generous response to appeals for funds but it soon became apparent that such a large undertaking could not be maintained on a basis of benevolence, and it was financed by government loans from Great Britain and France. Up to June 1917, the Commission had received from the British Government $89,500,000 and from the French $66,000,000 for relief in Belgium, with an additional $108,000,000 from France for relief in her own invaded territory; charitable contributions amounted to over $30,000,000—about $16,000,000 from Great Britain and $11,500,000 from the United States, with $3,000,000 from the rest of the world; so that there was available over $299,000,000 in cash and kind. In June, 1917, the American Government took over the financing of the Commission for the following six months by granting loans of $75,000,000 to the governments of Belgium and France. The work included the provisioning of the entire population of the occupied areas, and for it some 7,000 committees were created under the control of two central organizations—the Commission for Relief in Belgium and the Comité National de Secours et d' Alimentation. The first shipment of food was made October 30, 1914, and more than 2,750,000 tons were subsequently shipped and distributed.

Belgium: Language and Literature. There is no Belgian language *per se*, the Flemings and Walloons each speaking their own tongue—that of the Flemings belonging to the Low German branch of the Teutonic class of Aryan languages; that of the Walloons being a French dialect.

Before the birth of Belgium as a nation in 1830 there had been no lack of writers among both Flemings and Walloons, but their productions were representative chiefly of their own districts or cities. Under the Napoleonic rule, as in France, literature was almost *nil*, and during the early years of the new nation interest centred in politics and business, rather than in literary accomplishment. Modern Belgian literature may therefore be said to begin with the Flemish movement, the object of which was the literary cultivation of the Flemish tongue and its establishment on a footing of complete equality with French. The originators and principal promotors of this movement were for the most part publicists, like Willems (1793–1846), called the 'father' of the movement, Blommaert (1809–71), Rens (1805–74), Snellaert (1809–72), Van Duyse (1804–59), and Vleeschhouwer; but its most influential champion, from the literary point of view, was the novelist Hendrik Conscience (1812–83), who not only wrote good historical novels like *De Leeuw van Vlanderen* (1838), but is especially famous for his excellent little stories of Flemish life, such as *Hoe men Schilderwordt* (1843), *Siska van Roosemael* (1844), *Rikketikke-tak* (1851), *De Arme Edelman* (1851), and *Het Geluk van rijk te zijn* (1855). The most important supporters of Conscience were the poet Ledeganck (1805–47), whose poetic trilogy, *Les Trois Villes Sœurs* (Ghent, Bruges, and Antwerp), was an impassioned defence of Flemish tradition; Rijswijck (1811–69), in political verse like *Refrains Politiques* (1844) and *Chansons Populaires* (1846); and DeCourt (1834–78), in various volumes of *Liederen*.

Flemish tendencies were also predominant in the poetical productions of Hiel (1834–99), who wrote songs for children; Van Beers (1824–88), in the poem of humble joys and sorrows, *Begga;* De Laeb (1815–91), in the romance *Het Huis van Wesenbeke* (1842), the village tale *Het Lot* (1846), and *Poems* (1848); Gezelle (1830–1900), who recorded his deep love for nature in *Rijmsnoer* (1897); Pol de Mont (b. 1857), who put characteristic work into *Claribella* (1893) and *Iris* (1894); De Geyter (b. 1830), in the radical war-cry 'Hymme de Gueux' in *Charles Quint* (1888), and in *Trois hommes* (1861); Van Droogenbroeck (1835), in *Rayons de soleil* (1866); the humorist Vuylsteke (1836), in *L'Amour silencieux* (1860) and *La vie d'etudiant* (1868); Antheunis (1840), in poems of domestic life, *Du fond du cœur* (1875) and *Vivre, aimer, et chanter* (1879); and, last but not least, Hélène Lapidoth-Swarth (1859), in several volumes of limpid and harmonious verse, such as *Beelden en stemmen* (1887) and *Riouwviolen* (1889). Virginie Loveling (1835) in poems, but more especially in numerous novels, distinguished for that rare combination of real power with a simple style—*e.g., Au pays flamand* (1877), *Le clef de la maison* (1883), *Sophie* (1886), *Een Dure Eed* (1892), and *Het Land der Verbeelding* (1896)—well sustained the tradition of Conscience, while Sleeckx and others have ploughed the same furrows. The study of Flemish folklore was much developed by Vervliet, Cornelissen, Harou, Penken, and other writers in the Brabant journal *Ons Volksleven.*

The part played by the Walloons in Belgian letters has been slight compared with that taken by the Flemings. Among the names associated with the Walloon movement are Charles Nicholas Simonon (1774–1847), whose *Collected Poems* appeared in 1845; J. F. E. Bailleux, founder of the Société Liégeoise, and Henri J. Forir (1784–1862) its first president; Nicholas Defrecheux (1825–74), the greatest of the Walloon poets; Edouard Remouchamps (1836), the dramatist; Henri Simon (1856), Julien Delaite, and Zephir Henin (1866).

In addition to works in Flemish and Dutch, there is a large body of Belgian literature written in French but nevertheless possessing a distinctly national character. Among the earlier works of this class are De Coster's sixteenth century romance *Uylenspiegel* (1867), and the *Feuillées, pensées, et maximes* (1862), *Jours de solitude* (1869), and *Lettres à José* (1884) of Octave Pirmez (1832–83). The later French writers fall into two main groups—(1) the Parnassians, represented chiefly by Giraud and Arenberg, and by the Walloons Gilkin, Gille, and Severin, and other supporters of the organ *Le jeune Belgique,* which aimed at preserving the ease, polish, and precision of the French classical style; (2) the mystical Franco-Flemish school embracing the most distinguished names in Belgian literature. The first strong note of the latter movement was struck by Lemmonier in his novel *Un mâle* (1881), and it was energetically carried on by Edmond Picard. The four greatest names associated with it are Eeckhoud, Verhaeren, Rodenbach, and Maeterlinck. Georges Eeckhoud, born in 1854, was Flemish to the core, describing with brutal realism the peasant life of Flanders and glorifying Flemish brutality and courage in such works as *Kees Doorik* (1883), *Kermesses* (1883), *Nouvelles kermesses* (1887), *La cycle patibulaire* (1892), *Mes communions* (1895), and *La faneuse d'armour* (1900). He wrote also a story of modern Antwerp—*Nouvelle Carthage*—satirizing the merchant and the respectable bourgeoise, and translated plays by Beaumont and Fletcher, Webster, and Marlowe.

Verhaeren (1855–1916) is the poet of Flanders—the most virile, varied, and spontaneous of the symbolists—a direct, poetic De Maupassant of Flemish race. Among his works may be mentioned *Les flamades, Les moines, Les campagnes hallucinées,* and *Les villes tentacularies.* Rodenbach (1855–98) was as Flemish a poet as Verhaeren, but he was saturated with mediævalism and has been called the 'poet of silence.' His works are morbid and melancholy in the extreme, yet tinged with a delicacy of tone that is inimitable. His best known work is *Bruges la morte.*

Maurice Maeterlinck, the most famous of Belgian writers and one of the first to attain a world reputation, is the acknowledged example of complete synthesis of the Germanizing and Latinizing forces which meet in the Belgian people. He combines the visual quality so characteristic of his race and their extreme mysticism. (See MAETERLINCK.)

Other names in modern Belgian literature include the poets Elskamp and Demolder; the novelist and playwright Cyriel Buysse; the historians Baron de Lettenhove, Louis Gachard, Rahlenbeck, Pirenne, Kurth, De Potter, D'Alviella, and de Marez; the economist de Laveleye; Rooses, Reclus, Nys, Hamelins, Gevaert, and Fétis. Consult Hamelins' *Histoire politique et litteraire du mouvement flamand.*

Belgorod. See BIELGOROD.

Belgrade, bel-grād, city, capital of the Serb-Croat-Slovene State, is situated at the junction of the rivers Danube and Save, opposite Semlin, 251 miles southeast of Budapest. The famous citadel, now in a somewhat dilapidated condition, stands on a hill 133 feet high, overlooking the two rivers. In its upper part are prisons and an army museum; in the lower part barracks, magazines, the *Heboysha* (torture tower), and the Emperor Charles Gate. Kalemegdan Park, a favorite resort and one of the city's chief attractions, lies just south of the fortress. Beyond this is the town proper—prior to the Great War a thoroughly modern city with wide streets, fine buildings, and excellent lighting and transit facilities. The great mosque, national theatre, (1871), museum, cathedral (1845), university, royal palace, and national library (150,000 vols.) are the principal features of interest. Industries are comparatively insignificant, but commercially the city was of considerable importance, being the centre of the Serbian export trade, and the entrepôt of trade between Turkey and Austria. Pop. (1872) 26,674; (1911) 90,890; (1921) 111,740.

The strategical importance of Belgrade was recognized from the earliest times. During the eleventh and twelfth centuries the fortress was held by the Greek emperors till it fell into the hands of the Magyars, who for long successfully disputed its possession with the Serbians and Turks. It was heroically defended in 1456 by Hunyadi (q.v.), and remained one of the greatest obstacles to the advance of the Crescent till captured by Sultan Solyman in 1521. It was taken by the Austrians in 1688, but was recaptured in 1690 by the grand vizer Mustafa Köprili and continued in the possession of the Ottomans till Prince Eugene retook it in 1717. From 1738 till 1862 it was again under Turkish rule. In the latter year it was transferred to Serbia and was made the capital of that principality.

In the Great War (1914–19) Belgrade was bombarded by the Austrians on July 29, 1914. It was evacuated by the Serbians Dec. 1, 1914, having been practically reduced to ruins by bombardment, was occupied by the enemy Dec. 2, and was retaken by the Serbians Dec. 5. It fell again on Oct. 9, 1915, and remained under Austrian control until Nov. 3, 1918, when it was re-occupied by the Serbians. Following the war Belgrade became the capital of the new Serb-Croat-Slovene state.

Belgravia, bel-grā'vi-*a*, a fashionable district in the southern part of the West End of London, built between 1826 and 1852. It borders on Hyde Park, the Green Park, and Buckingham Palace Gardens.

Belial, bē′li-*a*l, a Hebrew word meaning worthlessness or wickedness in an ethical sense, usually found in connection with a person, as 'man of Belial.' Although not originally a proper name, it came to be so regarded. It occurs once in the New Testament (2 Cor. VI. 15), where Paul uses it as the equivalent of Satan.

Belief, in general, that of which one is persuaded. The word is used, however, in several senses. (1.) It may signify an element in all serious judgment (as distinguished from mere imagination and from wilful falsehood)—*viz.*, that the judgment is taken to be true of reality. It is to be observed however, (*a*) that this truth may be asserted with various degrees of assurance, from full certainty to the vaguest probability; (*b*) that the reality may be that of a fictitious world, as, for example, when it is said that 'Ivanhoe did not *really* marry Rebecca as Thackeray *falsely* makes him do.' (2.) Belief may be used in a narrower sense to signify the conviction that attaches to a probability, as distinguished from that which belongs to certain knowledge. (3.) Belief is also used as equivalent to faith in the religious sense—faith as contrasted with sight. In this sense, it is opposed, not as probability to certainty, but as one kind of certainty to another. That is to say, the certainties of faith, resting upon moral and spiritual experience, are contrasted with those resting solely upon sense experience, or observation. (See, also, FAITH.)

Belinsky, be-lin′ski, VISARION GRIGORIEVITCH (1810–48), Russian literary critic, was born at Chembar in the government of Penza, son of an army surgeon. He studied at Moscow, and early entered upon a journalistic career, his first important work, an admirable *Survey of Russian Literature since the Eighteenth Century*, appearing in 1834. Writing at first in the spirit of Hegel and Schelling, he later abandoned his early ideas for the theory that the essence of literature is to give an idealized picture of actual life. As a writer, he was a master of style and his work is characterized by vigor and passion. As a critic, he was a true reformer, and fought despotism, insincerity, and slavery with all his energy. He was keenly alive to the merits of his Russian contemporaries, and it was he who first showed the real value of the works of Pushkin, Lermontov, and Gogol to the national literature. His short life was a constant struggle with poverty and ill health, and his death occurred from tuberculosis in 1848. His complete works appeared in 1859–62 in twelve volumes.

Belisarius, bel-i-sā′ri-us, (*c.* 500–565) (Slav. Beli-tzar, 'white prince'), the greatest general of the Byzantine empire, is said to have been a native of Thrace. After Justinian's accession to the throne in A.D. 527, Belisarius, who had been one of his private guards, was appointed to the command of the eastern army of the Empire. Between 529 and 532 he was occupied in repelling the inroads of the Persians; but Africa and Italy were the scenes of his greatest exploits. In 533 he was sent by Justinian into Africa to recover the provinces there held by the Vandal King, Gelimer (q.v.). After achieving two victories, Belisarius made the king a prisoner, seized his treasure, and conquering Sardinia, Corsica, and the Balearic Isles, brought him to Constantinople, where he appeared in a triumphal procession of the conqueror—the first that a subject had enjoyed since the days of Tiberius.

The first of the Italian campaigns, by which Justinian sought to wrest Italy from the Ostrogoths, began in 535. In that year Belisarius conquered Sicily. In 536 he occupied Lower Italy and entered Rome, which he defended for a year against Vitiges, the Gothic king. In 539 he seized Ravenna and took Vitiges captive but was recalled by the jealousy of Justinian. He was then engaged (541–2) against the Persians under Chosroes, but was again recalled through the intrigues of the Empress Theodora and his own wife Antonina. His second great struggle with the Ostrogoths now began. The barbarians under Totila having invaded and reconquered Italy, Belisarius was sent against them. After a five years' struggle, however, he was superseded by his rival, Narses, who completed his work by finally overthrowing the Ostrogothic kingdom. Belisarius gained his last victory against the invading Bulgarians in 559. In 563 he was accused of conspiring against Justinian, and was imprisoned for seven months, his property being confiscated. He was, however, restored to full honors by the emperor, the legend that he was deprived of his eyes and reduced to beg his bread being absolutely without foundation. He died in March 565.

The chief authorities on the life of Belisarius are the *Histories* of Procopius (his private secretary), Agathiás, and Theophanes. Consult also Gibbon's *Decline and Fall;* Mahon's *Life of Belisarius*; Bury's *Later Roman Empire; The Cambridge Mediæval History*.

Belize, b*e*-lēz′ (so named from the Spanish pronunciation of Wallace, a Scottish buccaneer), the capital of British Honduras, is situated on the Caribbean Sea at the mouth of the Belize River, which divides the town into two parts. It is the largest and most important town on the Caribbean coast of Central America, but the harbor is shallow and vessels are obliged to anchor a mile outside. The town is generally clean, with an English atmosphere. Flowers and fruit abound, and the climate is healthful. There is a considerable trade in logwood, mahogany, and chicle gum. Pop., (1921) 12,661.

Beljame, bel-zham′, ALEXANDRE (1842–1906), French writer and professor of English literature at the Sorbonne, Paris, was born at Villers - le - Bel, Seine-et-Oise. His works include *Le public et les hommes de lettres en Angleterre au XVIIIᵉ siècle* (1881) and numerous French translations of English classics, as *Macbeth, Othello*, and *Enoch Arden*. In 1905–6 he lectured at Cambridge University on English literature.

Bel′kine, IVAN, pseudonym of the Russian author, Pushkin (q.v.).

Bel′knap, bel′nap, GEORGE EUGENE (1832–1903), American naval officer, was born in Newport, N. H. He entered the navy in 1847, was in command of a launch at the capture of the Barrier forts, Canton River, China, (1856), and during the Civil War took a leading part in several naval engagements, including the capture of Fort Fisher, N. C. In 1873 he was assigned the duty of taking deep-sea soundings between the United States and Japan, with the object of ascertaining whether a cable route was feasible. He invented apparatus for determining the character of the sea floor, and published a work, *Deep Sea Soundings*. He was superintendent of the U. S. Naval Observatory in 1885. He became rear-admiral in 1889, and commanded the U. S. fleet on the Asiatic station from 1889 to 1892. He retired in 1894.

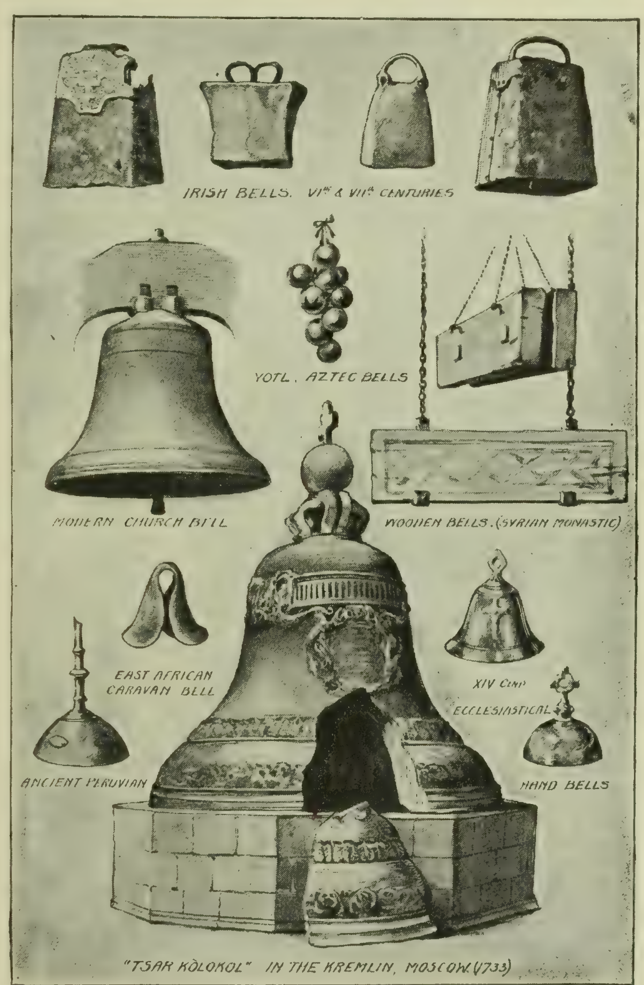
Belknap, WILLIAM WORTH (1829–90), American politician and soldier, was born at Newburg, N. Y., and was educated at Princeton. With the rank of major, he joined the Union army (1861), took part in the Shiloh, Vicksburg, and Atlanta campaigns; was made a brigadier-general of volunteers (1864) and major-general of volunteers in 1865. He was Secretary of War from 1869 to 1876, when he was impeached on charges of corruption, which, however, were not formally investigated because of his resignation.

Bell, a hollow metal instrument, usually cup-shaped, which, when struck, gives forth a ringing sound. Early specimens of bells have been found in Egyptian tombs, and small bronze articles, supposed to be bells, have been dug up in the ruins of Nineveh. The festival of the Egyptian Isis was celebrated with the sound of bells, and in the Old Testament bells of gold are mentioned as being suspended from the robes of the high priest. They were also used in Old Testament times in the trappings of horses and as ornaments. The Persians employed them for ornamentation, and in India and China they were probably known long before they were in use in Europe.

It is uncertain when bells were first employed in the Christian Church, although their introduction has been generally attributed to Paulinus, bishop of Nola (400 A.D). Bede mentions bells as being in use in England about the end of the 7th century, and in the 10th century St. Dunstan appears to have introduced them very generally. They play an especially important rôle in the services of the Roman Catholic Church. The *Ave bell* is rung at the time the Ave Maria is to be said; the *vesper bell* as a call to vespers; and the *sanctus bell* at the elevation of the Host in the celebration of the Mass. This last bell was formerly hung in a small turret outside the church, so that all within hearing of it might prostrate themselves. The *passing bell* was tolled when a soul was passing out of life, and this custom still survives, though the bell is now tolled *after* the death. In excommunication by *bell, book,* and *candle*, the bell was rung to summon the congregation to the ceremony. The consecration or baptism of bells is still practised in the Roman Catholic Church.

The most familiar secular use of the bell is the tolling or ringing of the hours. This practice is referred to by Lucian (b. *circa* 125 A.D.), who describes an instrument which marked the hours on a bell by means of water power. The curfew bell (Fr. *couvre feu*) is a later development. It was introduced into England from Normandy by William the Conqueror, and was rung at eight o'clock in the evening, to warn all persons to extinguish fire and light — a necessary precaution, when houses were built of wood. This practice, however, was enforced only during the reigns of William I. and William II., and was abolished by Henry I. The *tocsin*, or alarm bell, was hung in castles and fortresses, where it was sounded to announce the approach of an enemy.

Bells have been made in a great variety of forms and of a still greater variety of substances, but since the middle ages, for bells which are required to possess a high degree of richness and volume of tone, a modification of the hemispherical form and an alloy of copper and tin—called *bell-metal*—have been universally regarded as superior to all others. For large bells the best results are said to be obtained when the proportion of copper to tin is from three to four parts of the former to one of the latter. The thinner a bell is made in proportion to its size, the lower in pitch is its tone, and *vice versa*. The thickest portion of a bell is the part—called the *sound-bow*—against which the clapper strikes. The proportions of bells are not determined by fixed rules, but, generally speaking, in large bells the diameter at the lip is usually about 15 times, and the height about 12 times, the thickness of the sound-bow. Bells are said to be *true* only when the consonant upper-partials—the third, fifth and octave—are dead in tune with the fundamental or keynote of the bell. Bells may be lowered in pitch by thinning the inside of the sound-bow, but the only means of raising the


IRISH BELLS. VIth & VIIth CENTURIES
YOTL. AZTEC BELLS
MODERN CHURCH BELL
WOODEN BELLS. (SYRIAN MONASTIC)
EAST AFRICAN CARAVAN BELL
XIV Cent
ECCLESIASTICAL
ANCIENT PERUVIAN
HAND BELLS
"TSAR KOLOKOL" IN THE KREMLIN, MOSCOW (1733)

Various Types of Bells.

pitch is to lessen the height and diameter by cutting a portion from the rim all round, and this, besides altering, frequently impairs the quality of tone.

With the exception of modifications in methods of manipulation, the art of bell-founding has remained almost unchanged since its invention in mediæval times. Now, as then, bells are cast by forming a bell-shaped model, covering this with a larger mould and, through an opening in the top of the latter, pouring in molten metal until the space between the two is completely filled.

Bells are sounded either by being *swung* or by being *chimed.* A *peal* of bells is a suite of bells tuned in certain relations to each other. Peals of 'swung' bells never contain a greater number than twelve, but peals of 'chimed' bells—termed *carillon-peals*—may comprise forty or more. In Great Britain, bells 'rung in peal' in their primary or natural order of sequence are usually tuned to produce a succession of diatonic intervals, but 'carillon-peals' may be tuned to be capable of producing a complete chromatic scale. *Change-ringing* is the art of constantly varying, in accordance with certain prescribed rules, the order in which peals of 'swung' bells are rung; 'hunting,' 'dodging,' 'place-making,' 'singles,' 'doubles' and 'triples' are among the terms which are used to designate methods of manipulation. The number of bells contained in the 'peal' determines the number of changes which can be made—*e.g.*, on 3 bells 6 changes may be rung; on 6 bells, 720; on 12 bells, 479,001,600. The earliest known work on the subject of change-ringing is Fabian Stedman's *Tintinnologia* (pub. 1668). Large peals of swung bells are most numerous in England; in that of St. Paul's, London, which contains 12 bells, the tenor bell weighs over three tons.

Bells may be 'chimed' in various ways, but the term is generally understood to imply that, instead of being swung, the bells are struck—usually on the outside—by a hammer or wooden mallet. On the Continent, in peals of chimed bells which are constructed to play automatically, the hammers are called into action by a spiked revolving barrel regulated by clock-work (see MUSICAL BOX), but for large carillon-peals which are played by hand a species of keyboard mechanism is employed. The art of carillon playing is now much neglected, but during the 18th century some carilloneurs in the Netherlands were able to perform intricate fugal works in two and, with the aid of pedals, even in three parts. Among celebrated carillon-peals on the Continent, some of which are capable of being played either mechanically or by hand, are those of Antwerp, Bruges, Ghent, Louvain, Malines and Tournai; while of noteworthy English carillons may be mentioned those at Boston, Bradford, Manchester, Rochdale, Shoreditch and Worcester. In New York City, in the tower of the Metropolitan Life Insurance Building, is a chime of four bells, weighing about 7 tons, and said to ring at twice the height of any other peal in the world. These chimes are played by motive power derived from mechanism operated by the great clock in the tower. Another notable chime in the United States is that in the Chapel at West Point, consisting of twelve bells and said to be one of the finest in the world.

Tubular chimed bells are a recent invention and, being comparatively cheap, are likely to become popular; but so far, though made in sizes to cover a wide extent of compass, they are perhaps best known arranged in sets to form portable carillons.

Bells were at first comparatively small in size but about the thirteenth century bells of large size were beginning to be cast and by the fifteenth century some attained huge dimensions. The largest bell in the world, the great bell of Moscow, was cast in 1733, and weighs 198 tons. It was cracked either in the founding or later, and is unhung, but stands on a pedestal within the Kremlin. Another Moscow bell, said to be the largest in use, was given to the cathedral by the Czar Boris Godunoff; it weighs 128 tons; another, belonging to St. Ivan's Church, weighs 57 tons; one cast in 1819 weighs 80 tons. Other large bells are: the bell at Mingoon, Burma, 80 tons; great bell of Peking, 53½ tons; at Novgorod, 31 tons; at Cologne, 26¾ tons; at Nanking, 22 tons; the famous Mahajanda bell at Rangoon, 22 tons; at Olmutz, 18 tons; at Vienna, 17¾ tons; Great Paul (St. Paul's, London), 17½ tons; Big Ben (Westminster), over 13½ tons; bell at Erfurt, 13¾ tons; at Montreal, 13½ tons; at Paris (1680), 17 tons; Great Peter (York Minster), 10¾ tons. The finest collection of bells in any country is said to be that at the Mission Inn, Riverside, California.

See also ELECTRIC BELL; and for pneumatic bell, PNEUMATIC APPLIANCES.

Consult Denison (Beckett), *Clocks, Watches, and Bells* (8th ed.); Ellacombe's numerous works, especially *Chiming;* Doherty's *Bells, their Origin, Uses and Inscriptions* in vol. 48 of the *Archæological Journal;* Lomax' *Bells and Bell Ringers;* Myers' *Bells and Bell Lore.*

Bell, ACTON, CURRER, and ELLIS, a pseudonym of the Brontes. See BRONTE.

Bell, ALEXANDER GRAHAM (1847–1922), American scientist and inventor of the telephone, the son of Alexander Melville Bell, the inventor of 'Visible Speech' (q. v.), was born in Edinburgh, and moved with his family to Canada in 1870. He introduced his father's system for the education of deaf-mutes in a Boston school newly opened, and was appointed professor of vocal physiology in Boston University (1872). In 1876 he exhibited at the Philadelphia Exhibition the telephone, which he had been working on for some four years, and a company was organized for its development. He also invented the photophone (1880) and the graphophone (1887). He founded the Volta Bureau, which has published many of his important researches regarding the instruction of deaf-mutes. He was elected a member of the National Academy of Sciences in 1883; received the Volta Prize from the French government in 1881; and in 1882 a diploma and the decoration of the National Legion of Honor of France. He was greatly interested in the education of the deaf and served as president of the American Association to Promote Teaching of Speech to the Deaf, as president of the National Geographic Society, and as a regent of the Smithsonian Institution. His last few years were spent in efforts to make wider applications of his greatest invention, the telephone, and in the development of aviation, in which he took great interest. He died at Baddeck, Nova Scotia, Aug. 1, 1922. He was the author of many educational and scientific monographs. See TELEPHONY.

Bell, ALEXANDER MELVILLE (1819–1905), Scottish-American educator, father of Alexander Graham Bell, was born in Edinburgh, Scotland, and received his education from his father, Alexander Bell, inventor of a method for removing impediments of speech. He was lecturer at Edinburgh and London, removed to Canada in 1870 and to Washington in 1881. His great work was the formulation of a method of instruction in phonology, known as Visible Speech (q. v.), which has been successfully used in teaching deaf-mutes to speak.

Bell, ANDREW (1753–1832), founder of the Madras system of education, was born and educated in St. Andrews, Scotland. He was a tutor in Virginia from 1774 to 1781, when he returned to Great Britain, and took orders in the Church of England. In

1789 he became superintendent of the Madras Male Orphan Asylum, where he developed the monitorial system of education, explained in his work, *An Experiment in Education* (1797). In 1816 he assisted at the formation of the National Society for Promoting the Education of the Poor, a church organization which founded over 12,000 schools on his method. In 1831 he transferred $600,000 to trustees for various educational purposes, principally in Scotland; half of this went to found the Madras College, St. Andrews. The chairs of education in Edinburgh and St. Andrews have grown out of the Bell Lecture on Education, established 1831. See Southey's *Life of Bell* (1844); Meiklejohn's *An Old Educational Reformer* (1881).

Bell, Sir Charles (1774–1842), discoverer of the distinct functions of the nerves; became fellow of the Royal College of Surgeons of Edinburgh (1799), and in 1804 contributed the account of the nervous system to his brother John Bell's *Anatomy of the Human Body.* The same year he removed to London, where his *Anatomy of Expression in Painting* was published (1806). Bell's great achievement was the discovery of the existence of distinct motor and sensory nerves, and the further discovery that the spinal cord gives off filaments of both kinds, the anterior roots being motor and the posterior sensory. The first hints of this discovery occur in a letter to his brother George (Nov. 26, 1807), but its final authoritative exposition was made in 1830, in a volume entitled *The Nervous System of the Human Body.* In 1812 he was appointed surgeon to the Middlesex Hospital, and in 1824 professor of anatomy and surgery at the Royal College of Surgeons, London. Knighted on the accession of William IV., Bell accepted the chair of surgery at Edinburgh University in 1836. Besides the volumes mentioned above, he was author of *A System of Operative Surgery* (1807), *Institutes of Surgery* (1838), and several other books, chiefly surgical. See *Letters of Sir Charles Bell* (1870).

Bell, George Joseph (1770–1843), advocate, brother of Sir Charles Bell, was admitted to the Scottish bar (1791). His *Treatise on the Laws of Bankruptcy in Scotland* (1804), republished in 1810 under the title *Commentaries on the Laws of Scotland* (7th ed. 1870), at once took rank as the authority in the domain of mercantile jurisprudence. Bell was elected to the chair of Scots law in 1822, and served on the commissions which resulted in the Scottish Judicature Act of 1825 and the Scottish Bankruptcy Act of 1839. He also wrote *Principles of the Law of Scotland* (1829; 6th ed. 1872). See *Edin. Rev.*, Apr., 1872.

Bell, Henry (1767–1830), one of the earliest introducers of practical steam navigation into the United Kingdom, was born at Torphichen Mill, near Linlithgow, Scotland. In Jan., 1812, his boat, the *Comet,* a thirty-ton vessel driven by an engine of three horse power, began plying between Glasgow and Greenock on the Clyde. It has been said that Robert Fulton, who built the first passenger steamboat, derived his ideas of steam navigation from Bell. See Steam Engine.

Bell, Henry Thomas Mackenzie (1856), English poet and critic. He went to London in 1884, publishing in the same year *Charles Whitehead,* a monograph on the poet (new ed. 1894). Among his works are *Spring's Immortality, and other Poems* (1893; 3rd ed. 1896); *Christina Rossetti: a Biographical and Critical Study* (1898); and *Pictures of Travel, and other Poems* (1898). A selection of verse appeared in 1901.

Bell, James Franklin (1856), American soldier, was born in Shelbyville, Ky., was graduated at the U. S. Military Academy in 1878, served in several Indian campaigns, and in the Philippines during the Spanish-American war till 1903. He was commandant at several army schools till 1906, when he became chief of the general staff of the army; promoted major-general in 1907.

Bell, James Montgomery (1837), American soldier, was born at Williamsburg, Pa., and graduated (1862) at Wittenberg College, Springfield, O. He entered the U. S. army as lieutenant, 1862, and was promoted for gallantry in the Battle of the Wilderness, and at Ream's Station, Va., during the Civil War. He saw much Indian fighting in the sixties and seventies, and served with distinction in the Cuban War and in the Philippines, where he became military governor of the third district of Southern Luzon, 1900, retiring in 1901 with the rank of brigadier-general.

Bell, John (1763–1820), surgeon, elder brother of Sir Charles Bell, became fellow of the Royal College of Surgeons, Edinburgh (1786), and in 1790 established himself in that city as an independent lecturer on anatomy and surgery. For twenty years Bell remained the leading operating surgeon in Edinburgh, and showed himself a bold innovator in surgical practice. Chief works: *Anatomy and Physiology of the Human Body* (1793–98); *Discourses on the Nature and Cure of Wounds* (1793–5); *Principles of Surgery* (1801–8; new ed. 1826).

Bell, John (1797–1869), American political leader, born near Nashville, Tenn. He graduated at the University of Nashville in 1814, was admitted to the bar in 1816, and became a prominent lawyer and political leader, being a Democrat until 1835, and thereafter a Whig. He was a member of the state Senate for one term, being elected in 1817; was a representative in Congress (1827–41) and speaker of the House of Representatives in 1834–5; was Secretary of War (Mar.-Sept., 1841), resigning, with the other members of the cabinet when, after the death of Pres. Harrison, Pres. Tyler broke with the Whig Party; and was a member of the U. S. Senate (1847–59). Throughout his Congressional career he took an influential part in debate, and was conspicuous among the Southern members for conservatism and for independence, opposing, for instance, the Kansas-Nebraska Bill and the Lecompton Constitution. On the approach of the Civil War, though his sympathies were with the South rather than with the North, he opposed disunionism, and in 1860 was the candidate, for the presidency, of the Constitutional-Union Party (q. v.) or 'Bell and Everett Party,' Edward Everett being the candidate for the vice-presidency. He received a popular vote of 588,879, most of which was cast in the Southern states; but received only 39 electoral votes, those of Ky., Tenn., and Va. When Tenn. seceded he gave his allegiance to his state rather than to the Union, but had no share in the Civil War.

Bell, John (1811–95), an English sculptor, born in Norfolk. His first exhibited work was a religious group (Royal Academy, 1832). His *Eagle-slayer* (1837) was exhibited in 1844; the well-known *Dorothea* belongs to 1841. For the Houses of Parliament he executed the statue of Lord Falkland (1847), and among his public works are the *Guards' Memorial* in Waterloo Place (1858), the *Crimean Artillery Memorial* (Woolwich), the *Wellington* monument at the Guildhall (1855–6), and the *United States* group in the Prince Consort Memorial, Hyde Park (1873). A copy of the latter is in Washington, D. C.

Bell, Robert (1800–67), Irish journalist and miscellaneous writer, edited the London *Atlas* for many years, contributed the 'History of Russia' and 'Lives of English Poets' to *Lardner's Cyclopædia,* became editor (1840) of the *Monthly Chronicle,* and published three comedies—*Marriage* (1842), *Mothers and Daughters* (1843), and *Temper* (1847)—together with two novels. His great work is his unfinished annotated edition of the

English poets in 24 vols. (1854–7; new ed. 1866–7).

Bell, ROBERT (1841), acting director of the Geological Survey of Canada (1901–6), born at Toronto. Joining the Canadian Geological Survey in 1857, he was geologist and medical officer on the expedition of the *Neptune* in 1884, and of the *Alert* in 1885, to Hudson Strait and Bay. The western branch of the Nodaway which he surveyed in 1895, is named Bell River after him. He was in 1863–7 professor of chemistry and natural science at Queen's University.

Bell, THOMAS (1792–1880), dental surgeon and zoologist, was appointed dental surgeon to Guy's Hospital (1817), professor of zoology at King's College, London (1836), secretary of the Royal Society (1848–53), president of the Linnæan Society (1853–61). Chief works: *Hist. of British Quadrupeds* (1837; revised 1874); *British Reptiles* (1839); *British Stalk-eyed Crustacea* (1853); and an edition of White's *Selborne* (1877).

Belladonna, a name for the deadly nightshade or common dwale (*Atropa belladonna*), a perennial poisonous plant of the order Solanaceæ, indigenous to S. Europe and Asia, and cultivated in the United States. It has a much-branched rhizome, which yearly sends up rank stems to the height of three feet; its leaves are alternate, broad, pointed, and from three to eight inches long. The flowers are one inch long, arise singly in the axils of the leaves, and are of a greenish purple color; the berries, about the size of cherries, are deep violet black, and have a sweet taste; sometimes eaten with fatal consequences. The whole plant has a heavy, unpleasant smell, especially when crushed. Belladonna is useful in medicine chiefly by virtue of its active principle atropine, procured from the root by distillation, first with alcohol, and at a later stage with chloroform, after which it forms colorless crystals. There are two extracts of belladonna, a tincture, a plaster, ointment, and liniment; atropine is also used hypodermically, in an ointment, and in lamellæ or discs, for ophthalmic purposes. For external application, belladonna is prepared with alcohol, chloroform, or some other volatile substance, that it may penetrate the unbroken skin. An inflamed surface or a mucous membrane will admit it more readily. So applied it affects the sensory nerve terminations, depressing them, and thus acting as a local anæsthetic and anodyne. Hence its use in superficial inflammation, and in muscular rheumatism, gout, and neuralgia. It also affects the special nerves to sweat-glands and milk-glands, and is therefore useful in hyperidrosis, and as an antigalactagogue. Applied to the eye, it dilates the pupil by paralyzing accommodation, and is therefore used by the ophthalmic surgeon when examining the fundus of the eye, and to prevent adhesions of the iris in inflammation. Internally given, its action proceeds on the same lines. It lowers all secretions except those of the kidneys, and it lessens sensitivity. It is used for lessening sweat production in phthisis. The brain is not affected by medicinal doses, but poisoning has been caused by the free application of belladonna to inflamed or broken skin. The commonest form of poisoning is found among children who have eaten the berries, all parts of the plant being poisonous. In such cases dryness of the mouth and throat is followed by dilated pupils, a flushed face, uncertainty of gait, and possibly delirium and stupor, followed by death. Treatment is first by the stomach-pump or emetics, and next by such a stimulant as hot coffee, with warmth, and, if need be, artificial respiration. Pilocarpine and morphine are said to be antidotes, but can only be administered by a medical man, while the other remedies could and should be used at once. Another effective and simple antidote is vinegar. Belladonna is also prescribed for nausea, vomiting, spasmodic coughs such as whooping-cough, hay-fever, and asthma.

Belladonna and Fruit.

Belladonna Lily (*Amaryllis belladonna*), a native of the Cape of Good Hope, which is hardy only in the Southern United States. It has large bulbs; its leaves develop in early summer, and die down before the flowering stems appear. The flowers are in umbels, pale rose in color, and about the size of white lilies.

Bellagio, tn. and summer resort, prov. Como, Italy, on the s. shore of the Lake of Como, at the apex of the peninsula which divides the two s. arms of the lake. It is in a most charming situation. It has numerous handsome villas and gardens—the Villa Melzi, built in 1810–15, being the most noteworthy. There is regular steamboat communication with Como and Lecco. Pop. (1901) 3,635.

Bellahouston, S.W. suburb of Glasgow, in par. of Govan, Lanarkshire, Scotland; has a very valuable cannel-coal pit. Pop. (1901) 10,906.

Bellaire, city, Belmont co., O., 3 m. s. of Wheeling, W. Va., on the Ohio R. and on the B. & O., the Pa. and other R. Rs. Iron, steel, farm implements, glass and enamel are the most important manufactures. Iron, coal and limestone occur abundantly in the region. Pop. (1910) 12,946.

Bellamy, EDWARD (1850–98), American author, was born at Chicopee Falls, Mass., and studied at Union College. He read law, and was admitted to practice, 1871, but early entered journalism, was assistant editor of the Springfield (Mass.) *Union*, 1872–6, and established with his brother the Springfield *Daily News*. He had published three works of fiction, *Six to One, a Nantucket Idyl* (1877), *Dr. Heidenhoff's Process* (1879), and *Miss Ludington's Sister* (1884), when his socialistic romance, *Looking Backward*, 2000–1887 (1888), appeared, and hitting the spirit of the time, was enormously successful, causing the formation of 'Nationalist' clubs throughout the United States, and being translated into many foreign languages. His sequel, *Equality* (1897), is a rather perfunctory performance.

Bellamy, GEORGE ANNE, 'GEORGIANA' (? 1731 – 88), an Irish-English actress, was daughter of Lord Tyrawley, ambassador at Lisbon. Her first success was as Monimia in *The Orphan*, produced by Rich, Nov. 22, 1744. She afterward acted at Dublin and at Covent Garden, and played Juliet with Garrick (1750). See her own *Apology* (6 vols. 1785); Genest's *Account of the English Stage* and Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (1886).

Bellamy, JACOBUS (1757–86), a distinguished Dutch poet, was born at Flushing. He was first apprenticed to a baker, but sent (1782) by a clergyman to Utrecht University. He published *Gezan-*

gen mijner Jeugd (1782), *Roosje*, his most celebrated poem (1784), *Vaderlandsche Gezangen* (1783), and *Gezangen* (1785).

Bell Animalcules. See VORTICELLA.

Bellarmine, bel'är-min *or* mēn, or BELLARMINO, ROBERT FRANCIS ROMULUS (1542–1621), Roman Catholic theologian, was born at Montepulciano in Tuscany. He became a Jesuit (1560), lectured at Louvain, held an appointment in the Collegium Romanum (1576–89), and in 1590 accompanied the legation sent into France by Pope Sixtus v. He was made cardinal in 1599, and archbishop of Capua in 1601, but resigned this post in 1605. He was a rigorous ascetic, and one of the greatest theologians that the Roman Catholic Church has produced. His works include: *Disputatio de Controversiis Christianæ Fidei* (3 vols., 1581), *Christianæ Doctrinæ Applicatio, Potestate Summi Pontificis* (1610), *Institutiones Hebræicæ Linguæ, De Scriptoribus Ecclesiasticis, De Ascensione Mentis in Deum.*

Bellary, bel-lä'-ri, district and town, Madras, India. The district, lying between the Nizam's territories and Mysore, has an area of 5,714 square miles.

The town, which is one of the principal military stations in Madras, is strongly defended by two lines of fortifications, the upper fort crowning a rock 450 feet high. Pop. (dist.) 950,000; (town) 58,000.

Bellatrix, bel'a-triks (γ Orionis), a white star of 1.6 photometric magnitude, situated in the right shoulder of Orion. Bellatrix is a typical helium star. No parallax has been determined for it.

Bellay, be-lā', JOACHIM DU (1524–60), French poet, surnamed 'The French Ovid,' and 'Prince of the Sonnet,' was born in Lyré, near Angers. He was closely associated with Ronsard, whom he met in 1548, and with the famous group of poets known as the *Pléiade*, who sought to create a French school of Renaissance poetry. His well known *Deffense et illustration de la langue francoyse* (1549) in prose was followed by *Recueil de poésie, L'Olive, Les antiquitez de Rome* (1558), *Regrets* (1559), and *Les Jeux rustiques.* A few of his poems—among them his best known piece, *Vanneur*—have been translated by A. Lang in *Ballads and Lyrics of Old France* (1872).

Bell Bird, a name given to various birds on account of their bell-like note. It is applied especially to *Chasmorhynchus niveus*, the campanero of the Spanish settlers in Guiana, one of the chatterers; and to *Anthornis melanura* in New Zealand, a member of the family Meliphagidæ. The former is remarkable for a jet-black caruncle, about three inches long, which depends from the beak, and becomes elongated when the bird utters its bell-like note.

Bell Buoy. See BUOY.

Belle Alliance, bel-lȧl-i-äns', a farm in the centre of the French position at the battle of Waterloo, 13 miles south of Brussels, in Belgium. Belle Alliance is the name the Prussians give to the battle.

Belleau Wood (Fr. *Bois de Belleau*), be-lō', a wooded height, in the region northwest of Château Thierry, France, occupied by the Germans during the Great War and strongly defended by German infantry and machine gunners. It was attacked by the Second Division of the American Army (including two regiments of Marines) on June 10, 1918, and the following day, after violent fighting, was reported cleared of the enemy. A counter attack was opened by the Germans on June 13 and fighting of the most desperate character was continued until June 26, when the Allied possession of the wood was assured. In honor of the brilliant exploits of the U. S. Marines the wood was renamed by special order of General Dégoutte, *Bois de la Brigade de Marine.*

Belleek', town, county Fermanagh, Ulster, Ireland, at the west end of Lough Erne; 3 miles east of Ballyshannon. It is famous for its production of *Belleek China*, a fine grade of porcelain highly glazed.

Bellefontaine, bel-fon'-tān, city, Ohio, county seat of Logan county, on the Cleveland, Cincinnati, Chicago and St. Louis, and the Toledo and Ohio Central Railroad; 30 miles north of Springfield. It has extensive railroad yards and car shops, flour mills, and manufactures of carriages, automobile bodies, iron and steel bridges, harness, automobile parts, cigars, brass faucets, and cement. Pop. (1910) 8,238; (1920) 9,336.

Bellefonte, bel-font', borough, Pennsylvania, county seat of Centre county, on the Pennsylvania and the Bellefonte Central Railroads; 34 miles southeast of Clearfield. It is beautifully situated at the foot of Bald Eagle Mountain, and is a popular summer resort, well known for a spring which has, with its abundant outflow, supplied the borough since 1807. It has flour and planing mills, iron and brass works, large lime and limestone operations, and a match factory. Pop. (1910) 4,145; (1920) 3,996.

Belle Fourche River, bel fo͞orsh', the northern fork of the Cheyenne River (q. v.).

Belle-Ile-en-Mer, bel-le'-län-mâr', island, Atlantic Ocean, forming a part of the department of Morbihan, France, lies 7 miles south of Quiberon Point, France. It is 11 miles long and from 2 to 7 miles wide, with an area of 34 square miles. There are pilchard and sardine fisheries, horses are bred, and agriculture is practiced. Off its coast the British fleet under Hawke defeated the French under Conflans in 1759. It was taken by the British in 1761, but was restored to France by the Treaty of Paris in 1763. Pop. 10,000.

Belle Isle, bel īl', a rocky island, 9 miles long and 3 broad, at the Atlantic entrance to *Strait of Belle Isle*, Newfoundland; has two lighthouses, one of them 250 feet high. It is noted as the place of origin of the Newfoundland dog.

Belle Isle, island, Conception Bay, Newfoundland, about 6 miles long and 3 miles broad. It is fertile and picturesque, having lofty cliffs.

Belle Isle, CHARLES LOUIS AUGUSTE FOUQUET, DUC DE (1684–1761), French marshal, grandson of the famous intendant Fouquet, was born at Villefranche in Aveyron. He served with distinction in the War of the Spanish Succession, and was made governor of Metz and a marshal of France. In the war of the Austrian Succession he shared with Broglie the command of the forces, stormed Prague in 1741, and the following year conducted the masterly retreat to Eger. He became minister of war in 1758, and created the military Order of Merit in 1759.

Bellenden, bel'*e*n-den (BALLENTYNE), JOHN (fl. 1508–50), Scottish poet and translator employed by James v. to translate Hector Boece's Latin *History of Scotland*, which was reprinted at Edinburgh in 1821, edited by Thomas Maitland, Lord Dundrennan. This was followed, also at the king's request, by a translation of Livy, which was first published at Edinburgh in 1822, also edited by Lord Dundrennan.

Bellenden, WILLIAM (*c.* 1555–1633), Scottish classical scholar of the family of Ballantyne or Bellinden, is said to have been professor at the University of Paris. He published *Ciceronis Princeps* (1608), a collection of Cicero's remarks on regal government; *Ciceronis Consul* (1612), a similar work concerned with consular authority; *De Statu Prisci Orbis* (1615); *De Tribus Luminibus Romanorum* (1634)—unfinished—an elaborate history of Roman institutions drawn from Cicero.

Belle Plaine, city, Iowa, Benton county, on the Iowa River and the Chicago and North Western Railroad; 34 miles southeast of Marshalltown. It is the centre of an agricultural and dairying district and has foundries, machine shops, a brick and tile factory, cannery, and creamery. Pop. (1910) 3,121; (1920) 3,887.

Bellerophon, be-ler'ō-fon, a genus of univalve molluscs abundant in the earlier geological formations. The shells are globular, coiled in a flat spiral in one plane; the mouth is large and circular, with a deep notch in the outer lip, which, as the animal continues to grow, is gradually filled in with calcareous matter, forming a band or keel along the centre of the convex aspect of the shell.

Bellerophon (originally called HIPPONOUS), in Greek legend, son of Glaucus, king of Corinth, and of Eurymede, daughter of Sisyphus. Having accidentally killed the Corinthian Bellerus, he fled to his relative Prœtus, king of Argos, whose wife, Antea, fell in love with the young hero. He rejected her offers, whereupon in revenge she poisoned her husband's mind against his guest. Prœtus sent him to his father-in-law, Iobates, who imposed upon Bellerophon the task of slaying the Chimæra. Mounted on the winged steed Pegasus, he succeeded in killing the monster with his arrows. He was next sent against the Amazons, whom he also defeated. On his way home he destroyed an ambuscade of Lycians, sent by Iobates for his destruction. Subsequently the wrath of the gods fell on him, and he wandered, 'devouring his soul,' in loneliness through the Aleian fields.

Belleville, bel'-vil, city, Illinois, county seat of St. Clair county, on the Southern, the Illinois Central, and the Louisville and Nashville Railroads; 18 miles southeast of St. Louis. It is the see of a Roman Catholic bishop and the seat of St. Elizabeth Hospital and other philanthropic institutions. Its principal industries are foundries and machine shops, flour mills, and manufactures of stoves, nails and tacks, shoes, and bricks. According to the Federal Census for 1919, industrial establishments number 114, with products valued at $14,017,292. Pop. (1900) 18,756; (1910) 21,122; (1920) 24,823.

Belleville, city, Kansas, county seat of Republic county, on the Union Pacific and the Chicago, Rock Island and Pacific Railroads, and on the Pike's Peak Ocean-to-Ocean, and the Winnipeg-Gulf Highways; 201 miles northwest of Kansas City. The city has a hospital and a well-equipped tourist camp. It is the centre of a productive agricultural district, and has grain elevators, flour mills, lumber yards, a creamery, bottle works, and an ice factory. Pop. (1910) 2,224; (1920) 2,254.

Belleville, town, New Jersey, Essex county, on the Passaic River and the Erie Railroad; adjacent to Newark, of which it is a residential suburb. It has a public library and Elks' Home. Industries include brass foundries and manufactures of chemicals, rubber goods, brushes, dynamos, baking machinery, and metal goods. Pop. (1910) 9,891; (1920) 15,660.

Belleville, town, Ontario, Canada, county seat of Hastings county, on the Bay of Quinte, Lake Ontario, and on the Canadian Pacific and the Canadian National Railways; 48 miles west of Kingston, and 113 miles east of Toronto. It is the seat of Albert College and of the Provincial School for the Deaf, and has a business college. There are mills, foundries and manufactures of cement, industrial alcohol, optical goods, and lock apparatus. According to the Canadian Census for 1919, industrial establishments number 101, with products valued at $3,922,488. Belleville is a thriving trade centre for dairy products, live-stock, fruit, grain, fish, and lumber. Pop. (1911) 9,876; (1921) 12,206.

Bellevue, bel-vū', city, Kentucky, in Campbell county, on the Ohio River, opposite Cincinnati, of which it is a residential suburb, and on the Chesapeake and Ohio Railroad. The chief industry is the quarrying of sand and gravel. Overalls and license plates are manufactured. Pop. (1910) 6,683; (1920) 7,379.

Bellevue, city, Ohio, Huron and Sandusky counties, on the Pennsylvania, the New York Central, the New York, Chicago and St. Louis, and the Wheeling and Lake Erie Railroads; 13 miles southwest of Sandusky. Bellevue has a unique sewage system which consists of a series of holes (100 feet deep) drilled to connect with a natural underground stream emptying into Lake Erie. Industries include limestone quarries, railroad shops, and the manufacture of stoves, cultivators, and automobile accessories. Pop. (1910) 5,209; (1920) 5,776.

Bellevue, borough, Pennsylvania, Allegheny county, on the Ohio River, adjoining Pittsburgh, of which it is a residential suburb. It has the Suburban General Hospital and the Balph Memorial Park. Pop. (1910) 6,323; (1920) 8,198.

Bellew, bel'ū; *often* be-lo͞o', HAROLD KYRLE (1857–1911), English actor and playwright. After varied experiences in the British Navy, the Australian goldfields, and in journalism, he achieved a rapid success on the English stage. He was leading man at Wallack's Theatre, New York (1885–6), and toured with Mrs. Brown Potter with a repertoire of plays. He also wrote several plays, including *Yvonne, Iolande, Hero and Leander,* and *Charlotte Corday.*

Belley, bel-ā', town, department of Ain, France, near the Rhone; 39 miles by rail southeast of Bourg. It has an interesting cathedral (9th century) and bishop's palace (1609), and produces lithographic stones. Pop. (1921) 6,200.

Bellflower. See CAMPANULA.

Belli, bel'lē, GIUSEPPE GIOACHINO (1791–1863), Italian dialect poet, was born in Rome. In his youth he held a government post, and was secretary to a prince, but afterward he devoted himself to poetry, writing in the Roman dialect more than 2,000 sonnets (1831–46).

Bellig'erent is the term applied to a nation in a state of war. Its use marks an important distinction in international law between a *de facto* government at war and a subject state or race in rebellion, though in some instances, even when a nation is divided by internecine strife, recognition of the combatants as belligerents may become inevitable. Such was the case when, during the Civil War, Great Britain and France recognized the Southern States as a belligerent power.

A belligerent has the right to use every means which he considers necessary to bring his enemy to terms. This broad and general right, however, is modified by the humane usage of nations, and by international compact. These modifications, in their widest application, are summarized in the project of an international declaration concerning the laws and customs of war drawn up by the Brussels Conference of 1874, but not ratified. These prohibit the use of poisons or poisoned weapons, the murder of enemies or antagonists who lay down their arms, the employment of arms, projectiles, or substances which cause unnecessary suffering, such as explosive bullets (prohibited by the declaration of St. Petersburg in 1868, and signed by most European states), the abuse of a flag of truce, the national flag, the Geneva Cross, or the insignia or uniform of the enemy, attack or bombardment of open, or undefended towns or villages, and in case of bombardment of a fortified place direct that hospitals, religious, artistic, scientific, and charitable buildings, not used at the same time for military purposes, be spared. No town taken by storm shall be given up to plunder. Lawful and disarmed enemies are prisoners of war, to be maintained and treated with humanity, and not to be deprived of their personal property. They may be interned in any locality, but may not be placed in confinement unless such is absolutely necessary. They may be employed on public works, but not in the operations of war. Prisoners attempting to escape may after summons be shot, and if retaken may be punished, but an escaped prisoner retaken is not liable to punishment for his previous escape. Exchange of prisoners and release on parole are lawful. If parole is broken and the prisoner is recaptured, he is deprived of the rights accorded to prisoners of war. War correspondents and other noncombatants with an army may be treated as prisoners of war, but spies and marauders have no such rights. For duties of belligerents with regard to the sick and wounded, see Geneva Convention. The population of an occupied territory cannot be compelled to fight against their own country, nor be made to swear allegiance to the enemy's power. The honor and rights of the family, the life and property of individuals, and their religious convictions and exercises should be respected. Private property cannot be confiscated, and pillage is expressly forbidden. Regulations are also made as to the duties of belligerents with regard to flags of truce, capitulations, armistices, belligerents interned and wounded treated in neutral territory.

See also War, Laws of; Contraband of War; Paris, Declaration of; Hague Conferences; International Law.

Bellingham. See Perceval.

Bel'lingham, city, Washington, county seat of Whatcom county, on Puget Sound, and Bellingham Bay, and on the Chicago, Milwaukee and St. Paul, the Great Northern, and the Northern Pacific Railroads; 100 miles north of Seattle and 57 miles south of Vancouver, B. C. Electric railways and motor stage lines connect with surrounding towns, and there is ferry service to Vancouver Island. It is the nearest American city to Alaska and has steamship connection with Pacific and Atlantic ports. The city occupies an ideal site on the Pacific Highway with Mount Baker as the chief scenic attraction, and enjoys the advantage of one of the finest land-locked harbors in the world. The County Court House, the High School and State Normal School are among the most notable buildings.

Bellingham is the centre of a profitable agricultural region with poultry, grains, hay, and sheep as the leading products. The city is notable for being the tulip centre of the country, the experimental farm conducted by the U. S. government being located here. A great amount of shipping is carried on, principally in lumber. The industrial establishments include shingle mills, sawmills, and salmon canneries, one of the latter being among the largest in the world. The manufacture of cement, and dairy and food products is also of importance. The city was formed by the Union of Whatcom and Fairhaven, Dec. 28, 1903. Pop. (1910) 24,298; (1920) 25,585.

Bellingham, Richard (1592–1672), American colonial governor, was born in England, and went to America in 1634, being one of the original patentees of the Massachusetts colony. He was made deputy-governor in 1635, and governor for the first time in 1641, a position which he held continuously from 1665 until his death. He declined to return to England at the behest of Charles II.'s commissioners in 1664, to give an account of his conduct, and was able to smooth matters over by the present of a shipload of masts to the king. Bellingham was an honest but opinionated official, being especially severe in his treatment of the Quakers.

Bellingshausen, bel'ingks-hou'zen, Fabrian Gottlieb von (1778–1852), Russian explorer and naval commander, was born on the island of Osel. He headed an expedition which sailed in 1819 for the Antarctic regions and discovered Traversay Island, Peter Island, and Alexander Land, bestowing on them their respective names. Returning to Russia in 1821, he subsequently received the command of the Russian fleet in the Baltic, and finally became military governor of Cronstadt. A report of his work of exploration appeared in 1831.

Bellini, bel-lē'nē, Gentile, (? 1429–1507), Italian painter, eldest son of Jacopo Bellini (q. v.), was probably born in Padua. He studied and worked in his father's studio and is believed to have settled in Venice about 1460. In 1464 he was commissioned to decorate the doors of the organ of St. Mark's, and the following year he painted the portrait of the Patriarch Lorenzo Guistiniani, now in the Academy of Venice. By 1474 his reputation was firmly established and he was appointed to restore the decorations of the Sala del Gran Consiglio in the Ducal Palace and in 1479 was sent at the expense of the state to Constantinople, to paint the portrait of Sultan Mehmet II., who created him Bey. On his return to Venice Bellini resumed his work in the Council Hall and painted several large canvases depicting events in Venetian history, most of which were destroyed by fire in 1577. Among his finest works are *The Miracle of the Cross*, in the Academy at Venice, and the *Preaching of St. Mark*, in the Brera, Milan. Gentile's fame has been somewhat over-shadowed by that of his younger brother Giovanni, but during his lifetime he was probably considered the chief artist in Venice. His coloring is harmonious and his draughtsmanship excellent.

Bellini, Giovanni (*c.* 1431–1516), famous Italian artist, younger son of Jacopo Bellini (q. v.), was born in Padua or in Venice. He worked and studied with his father and brother in the former's studio and was greatly influenced by his brother-in-law, Andrea Mantegna (q. v.), especially in his earlier works. Upon his brother Gentile's departure to Constantinople, Giovanni was appointed to his position in the redecoration of the Ducal Palace and spent the remainder of his life on this undertaking and in executing private commissions, his chief work being the painting of altar pieces. During the last years of his life he was surrounded by pupils and imitators, the most famous of whom are Giorgione, Titian, and Tintoretto. Bellini is probably the greatest Italian artist of the 15th century. His work combines beauty of coloring, correctness of drawing, and vigor of treatment with the purest religious feeling. Among his most famous works, several of which are in the National Gallery, London, are the *Transfiguration; Madonna and Saints; Madonna between Saint Paul and Saint George;* several *Pietas; Doge Loredano; Madonna and Adoration of the Magi; Christ's Agony in the Garden;* and the *Coronation of the Virgin*. The Metropolitan Museum, New York City, has one of his *Madonnas*. Consult Berenson's *Venetian Painters of the Renaissance;* Tytler's *The Old Masters and Their Pictures;* Meynells' *Giovanni Bellini*.

Bellini, Jacopo (*c.* 1400–70), Italian painter, founder of the Venetian school of the 15th century, was born in Venice, the son of a tinsmith. He was a pupil of Pisanello and Fabriano, and accompanied the latter to Florence, where he became involved in trouble with a Florentine artist and was obliged to leave the city. He returned to Venice about 1429, and some years later joined the School of St. John the Evangelist, for which he executed many important works, including a series representing the life of the Virgin and Christ, all of which have perished. About 1450 he established a studio, probably in Padua, where he and his sons worked. Very little of his work has survived, the only authentic examples being a damaged *Madonna and Child* in the Venice Academy, a similar composition in the Tadini Collection at Lovere, and a *Crucifixion* in the Gallery at Verona. One of his sketch books is in the British Museum and another in the Louvre, Paris. He was a fine draughtsman but lacked precise knowledge of anatomy.

Bellini, Lorenzo (1643–1704), Italian physician and anatomist, was professor of anatomy at Pisa and senior consulting physician to Pope Clement xi. He discovered the action of the nerves on the muscles and the uriniferous tubes, known as Bellini's tubes. His research work in this connection is described in his *De Structura et Usu Renum* (1662). He had also some literary talent and left one unique volume of poetry, the *Bucchereide* (1729).

Bellini, Vincenzo (1802–35), Italian operatic composer, was born in Catania, Sicily, and studied at the Conservatorio, Naples. After composing an aria, a symphony, several masses and a cantata, he produced his first opera in 1825, *Adelson e Salvini,* which met with immediate success. This was followed by *Bianca e Fernando, Il Pirata,* and *La Straniera.* His *Zaira* (1829) was a failure, but in 1831 he produced his most popular operas, *La Sonnambula* and *Norma.* His last work, *I Puritani,* was also extremely successful. Though Bellini had little dramatic power, he possessed a gift of charming melody, full of grace, pathos, and tenderness. Consult *Life* by W. A. Lloyd.

Bellinzona, bel'in-tsō'nȧ, town, Switzerland, capital of the canton of Ticino, on the left bank of the Ticino River; 20 miles north of Lugano. It has a fine Abbey Church dating from the sixteenth century, and on the hills surrounding the town are the picturesque ruins of Castello San Michele, Castello Montebello, and Castello Corbaro. Bellinzona was formerly regarded as the key to the St. Gotthard and San Bernardino passes, but the modern fortifications at St. Gotthard have rendered it of less importance. Pop. (1920) 10,232.

Bellite, an explosive prepared from nitrate of ammonia and mono or di-nitro-benzene. It can be stored and transported with safety, not being exploded by a blow or by friction. It was discovered in 1886, and is said to be three times more powerful than ordinary gunpowder.

Bellman, bel'män, Karl Mikael (1740–95), Swedish poet, was born in Stockholm and received an excellent education. From about the age of twenty-five he was a frequenter of inns and taverns, and in this environment his peculiar talent for verse and melody flourished. Having attracted the notice of Gustavus iii., he was given a small secretaryship and a yearly income, half of which he paid an assistant to do the work, while he continued his troubadour life on the remaining half. His poems, to which he usually composed zither accompaniments, are full of a kind of pathetic joyousness and unique charm, in spite of occasional coarse passages. The most important of Bellman's verses were issued as *Fredman's Epistlar* (1790) and *Fredman's Sanger* (1791). The best edition of his works is by Carlén (1881). Consult Erdmann's *Carl Michael Bellman.*

Bell Metal, an alloy used in the manufacture of bells. The usual composition is 75 parts of copper to 25 of tin, or 78 of copper and 22 of tin, although sometimes the alloy consists of copper, tin, zinc, and lead. A large percentage of copper gives a deep tone, but iron, zinc, and tin give a sharper ring.

Bello, bel'lō, Francesco, Italian epic poet (*c.* 1450–1505), known from his blindness as Cieco da Ferrara, lived at Mantua and Ferrara in great poverty. His poem in 45 cantos, *Mambriano* (first ed. 1509), is a chivalrous romance depicting the adventures of an Oriental prince, and is one of the books which directly inspired the *Orlando Furioso* of Ariosto.

Belloc, be-lok', Hilaire (1870–), English author, was born in France and was educated at Balliol College, Oxford, where he gained a scholarship in history. He served for a time in the French army and then entered the literary field, where he has achieved success as a magazine writer, historian, essayist, and novelist. He served two terms in Parliament (1906–10). His books include *The Bad Child's Book of Beasts* (1896); *The Modern Traveller* (1898); *Danton* (1899); *Lambkin's Remains* (1900); *Robespierre* (1901); *Path to Rome* (1902); *Emmanuel Burden* (1904); *The Old Road* (1905); *The Historic Thames* (1909); *First and Last* (1911); *Paris* (1912); *The Path to Rome* (1912); *The Book of the Bayeux Tapestry* (1913); *High Lights of the French Revolution* (1915); *Hills and the Sea* (1915); *The Elements of the Great War* (1915); *The Free Press* (1918); *Europe and the Faith* (1920); *The Jews* (1922); *Sonnets and Verses* (1923).

Bello Horizonte, bel'ō ō-rē-sōn'tā, capital of Minas Geraes, Brazil, on the slopes of the Serra de Espinhaco, northwest of the former capital, Ouro Preto; 376 miles northwest of Rio de Janeiro. It is a beautifully laid-out, up-to-date city with handsome public buildings, fine broad streets, gardens and modern improvements. There are cotton mills, and gold, iron and manganese occur in the vicinity. Pop. 60,000.

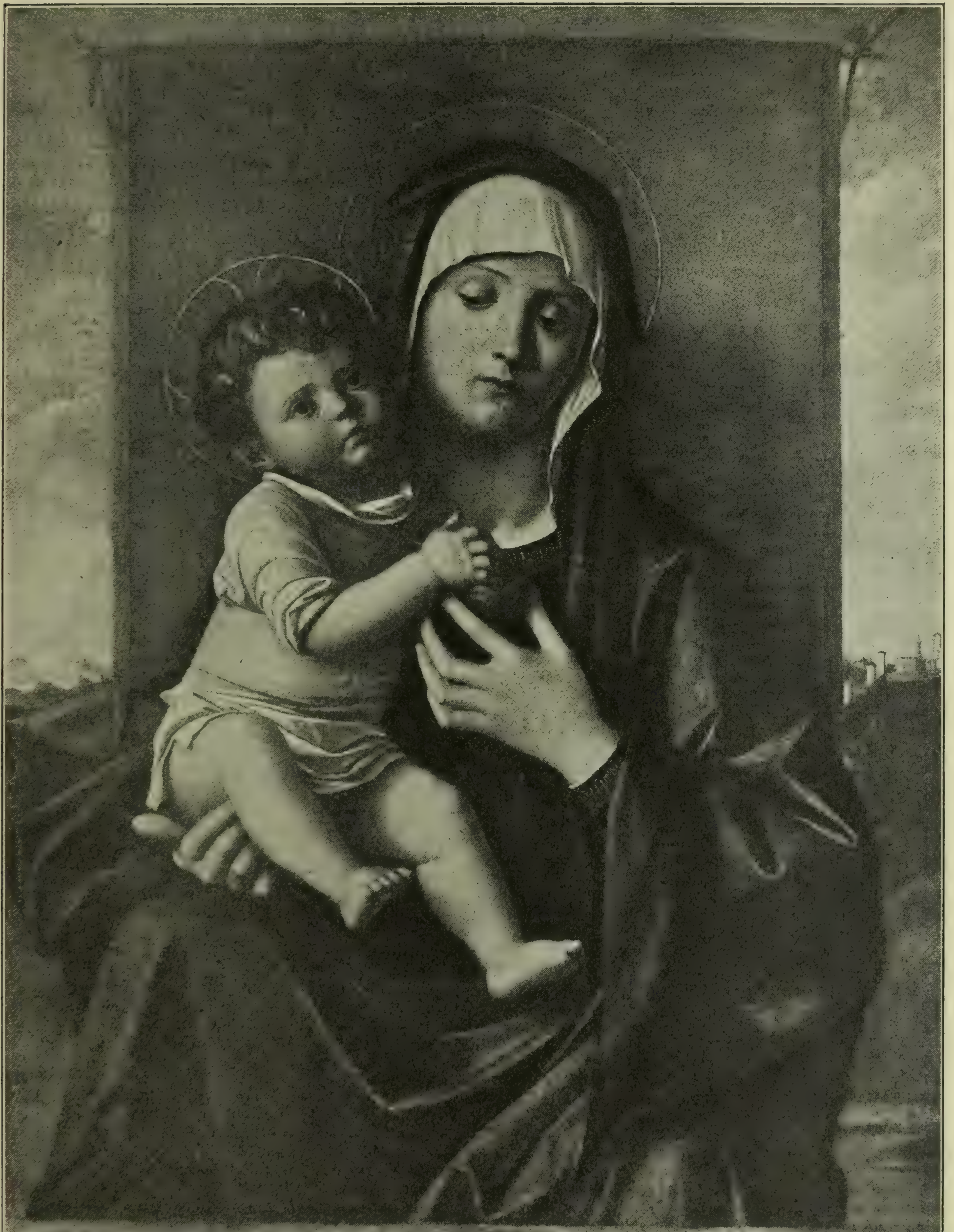
Bellona, bel-ō'na, the Roman goddess of war, sister, wife or daughter of Mars. Her worship is possibly of Sabine origin, but her first temple at Rome was not founded until 296 B.C., in the Campus Martius. In it the Senate assembled to give audience to foreign ambassadors, and to victorious generals. Consult Keightley's *Mythology of Ancient Greece and Italy.*

Bellot, bel-ō', Joseph René (1826–53), French naval officer and Arctic explorer, was born in Paris. He distinguished himself for bravery in the French expedition against Tamatave in 1845, and in 1851 joined the British Arctic expedition in search of Sir John Franklin, in the course of which he reached the strait called by his name. Two years later he accompanied an Arctic expedition whose chief object was to convey despatches to Sir Edward Belcher in the Polar Seas, and while attempting to cross some thin ice was blown into a deep crevice by a violent gust of wind and perished. Consult his *Journal* edited by Lemer (1854).

Bellot Strait, a narrow strait in the Arctic region between North Somerset Island and Boothia, connecting the Gulf of Boothia and Franklin Channel. It is about midway between the Arctic Ocean and Baffin Bay. It is some twenty miles long and one mile wide, and was discovered by Kennedy on the British expedition in search of Sir John Franklin, 1851, and named by him in honor of Lieutenant Bellot (q. v.).

Bellotto, Bernardo. See Canaletto.

Bellows, a mechanical device for producing a current of air. The usual form of bellows is a chamber formed of two pieces of wood, generally heart-shaped, fastened together with a flexible band of leather and having a nozzle at one end and a valve in the lower board for the admission of air. The air is admitted by the drawing apart of the boards and is forced out through the nozzle by the closing of the boards. There are various modifications of this common form.



MADONNA AND CHILD, BY GIOVANNI BELLINI

Bellows, George Wesley (1882–), American artist, was born in Columbus, O., was educated at Ohio State University and studied under Robert Henri. He has exhibited in Venice, Rome, Berlin, London, and the principal cities of the United States, and is a member of the National Academy. Bellows has been called the painter of democracy. One critic says of him that he suggests the American journalistic reporter armed with palette and brush rather than pen. His work is notable for its power rather than its beauty, and is vibrant with life and action. Among his best known paintings are *On the Beach, The Cliff Dwellers, Men of the Docks, Forty-five Kids, Lillian, Anne, Portrait of Dr. W. O. Thompson, The Circus, The River Front, The Polo Crowd.*

Bellows, Henry Whitney (1814–82), American clergyman, was born in Boston, Mass. He was graduated from Harvard (1832) and from the Cambridge divinity school (1837), and in 1839 was ordained pastor of the First Congregational church in New York, the name of which was twice changed, to the Church of the Divine Unity and to All-Souls Church. Here he served as pastor for forty-three years, gaining a considerable reputation for his eloquent preaching. He was founder and principal editor (1846–50) of the *Christian Inquirer*, a Unitarian weekly, and was on the staff of other religious papers. He delivered a course of Lowell lectures in Boston on *The Treatment of Social Diseases* (1857), and defended the moral influence of the stage in a lecture before the Dramatic Fund Society, the same year. He also published volumes of sermons and travels. From 1861 until 1878 Dr. Bellows was president of the U. S. Sanitary Commission (q. v.).

Bellows Falls, village, Vermont, Windham county, on the Connecticut River, and on the Rutland, and the Boston and Maine Railroads; 80 miles south of Montpelier. It is picturesquely situated amid mountainous scenery. The falls in the river have a descent of 50 feet. Paper, farm implements, and paper machinery are manufactured. Pop. (1910) 4,883; (1920) 4,860.

Belloy, bel-wä', Pierre Laurent Buirette de (1727–75), French dramatist, a native of Auvergne, entered the dramatic profession, and attained success as an actor in Russia. In Paris, in 1760, he produced his tragedy *Zelmire*, a marked success, followed by *Le Siège de Calais* (1765), also well received, and *Gaston et Bayard* (1771), which procured his admission to the Academy. Among his other plays are *Gabrielle de Vergy* (1770) and *Pierre le Cruel* (1772). His collected works were published by Gaillard in 1779 and 1787, and a selection by Anger in 1811.

Bell Pepper, the fruit of the *Capsicum grossum*, or Guinea pepper, used as a vegetable, and for pickling. See Pepper.

Bell Ringing. See Bell.

Bell Rock, or Inchcape Rock, a rocky reef, in the North Sea, off the coast of Forfarshire, Scotland, 12 miles southeast of Arbroath, surmounted by a lighthouse 120 feet high. The tradition that the bell placed there by the abbot of Aberbrothock was removed by a pirate whose vessel was at length wrecked on the reef is celebrated in Southey's ballad, *The Inchcape Rock.*

Bells, a nautical method of expressing the time of day. The twenty-four hours are divided into periods of four hours, each half-hour of these being represented by one bell. Thus, beginning at twelve o'clock, half-past twelve is 'one bell,' one o'clock 'two bells,' half-past one 'three bells,' two o'clock 'four bells,' continuing up to four o'clock, or 'eight bells,' when the round begins again.

Bell-Smith, Frederick Marlett (1846–), Canadian painter, was born and educated in London. After studying painting in Paris he went to Canada, living first in London, Ontario, and later in Toronto. He is known both for his successful work in figure and portrait painting and for his landscapes. His pictures of the Northwest and Rocky Mountain scenes are of particular merit. His best known works include *Landing of the Blenheim, with Sir John Thompson's Remains; Queen Victoria's Tribute to Canada; Lights of a City Life.*

Bell's Palsy, or Paralysis. See Paralysis.

Bell-the-Cat. See Douglas.

Bell Tower. See Campanile.

Belluno, bel-lōō'nō, province, Italy, in the northern part, lying between Tyrol and Venetia, with an area of 1,276 square miles. It is almost entirely mountainous and is watered by the Piave. Pop. (1921) 228,714.

Belluno, (Rom. *Belunum*), city and episcopal see, Italy, capital of the province of Belluno, is situated on a lofty height overlooking the Piave; 72 miles north of Venice. The chief points of interest are the Cathedral, dating from 1517, the Palazzo der Rettori, now the prefecture, the Municipio, and the Museum, with a good collection of paintings, bronzes, and natural history specimens. There are manufactures of silk and leather. Belluno was the birthplace of Pope Gregory xvi. Pop. (1921) 26,770.

Belluno, Duke of. See Victor, Claude Perrin.

Bellwood, borough, Pennsylvania, Blair county, on the Pennsylvania Railroad; 8 miles northeast of Altoona. Pop. (1910) 2,277; (1920) 2,629.

Bellwort, small perennial herbs (*Uvularia*) of the order Liliaceæ, found in Eastern North America. They have short creeping, fleshy rootstocks; slender stems; alternate leaves, oval, ovate, or lanceolate, with smooth margins; and drooping, bell-shaped flowers, with elongated perianth segments. The most striking, found in rich woods, is the Large-flowered or Smooth Bellwort (*U. grandiflora*), with a deep-yellow blossom. The Mealy Bellwort (*U. perfoliata*), is similar but with smaller flowers, of a paler color. The Sessile-leafed Bellwort (*Oakesia*) is similar to *Uvularia* but with a slender creeping root stock and rough-margined leaves. *O. sessilifolia*, or Wild Oats, is common in moist, low woods and grassy lands from Maine to Florida.

Belmez, bel-māth', town, Spain, province of Cordova, 45 miles by rail northwest of Cordova. It is the centre of important coal fields. Pop. about 12,000.

Bel'mont, town, Massachusetts, Middlesex county, on the Central Massachusetts and the Fitchburg divisions of the Boston and Maine Railroad; 6 miles northwest of Boston. It is an attractive residential town, and the seat of the McLean Insane Asylum. Market gardening is carried on. Pop. (1900) 3,929; (1910) 5,542; (1920) 10,749.

Belmont, village, Missouri, Mississippi county, on the Mississippi River, about 20 miles below the confluence of the Ohio, and on the Missouri Pacific Railroad. It was the scene of a sharp battle, Nov. 7, 1861, in which General Grant, after taking the Confederates' camp, was forced to retire before their overwhelming reinforcements. Pop. about 200.

Belmont, town, Cape of Good Hope, 50 miles southwest of Kimberley. Here, on Nov. 22 and 23, 1899, Lord Methuen drove the Boers from a strong position on the railway, and on the following day stormed Gras Pan.

Belmont, August (1816–90), American financier, was born in Alzey, Germany. He was in the employment of the Rothschilds in Frankfort and Naples until 1837, when he became their agent in New York. He was consul-general at New York for the Austrian government in 1844–50, was U. S. minister to Holland, 1854–8, and negotiated an important consular convention with The Hague government. Mr.

Belmont was active in both social and political life in New York, was president of the American Jockey Club for twenty years, and chairman of the National Democratic Committee from 1860 to 1872. He was a vigorous war Democrat, and used his influence with foreign leaders of finance in favor of the Union. As a banker, he was prominent in many large railroad transactions and acquired a large fortune.

Bel'mont, August (1853–1919), American banker, son of August Belmont (1816–90), was born in New York City and was graduated from Harvard University in 1874. On the death of his father, he became the head of the firm of August Belmont and Company, was a director in many corporations, and chairman of the board of directors of the Interborough Rapid Transit, the Interborough Consolidated Corporation, and the Rapid Transit Subway Construction Company.

Belmont, Perry (1851–), American lawyer and politician, was born in New York, and was graduated (1872) from Harvard. He studied law at Columbia, and practised in New York until his election to Congress. He was a member from New York, 1881–7, was chairman of the committee on foreign affairs, 1885–7, and was an active promoter of Democratic measures. Mr. Belmont was U. S. Minister to Spain, 1888–9, after which he resided in New York.

Beloit, bē-loit', city, Kansas, county seat of Mitchell county, on the Solomon River, and on the Missouri Pacific, and the Union Pacific Railroads; 195 miles northwest of Kansas City. It is the seat of the State Industrial School for Girls and has a public library, court-house, and Federal building. The chief industries are flour milling and trade in building stone, agricultural produce, and live-stock. Pop. (1910) 3,082; (1920) 3,315.

Beloit, city, Wisconsin, Rock county, on Rock River, at the southern boundary of the State, and on the Chicago and North Western, and the Chicago, Milwaukee and St. Paul Railroads; 85 miles northwest of Chicago. It is built on high ground, and has wide streets. It is the seat of Beloit College (q. v.) and has a public library. Industries include mills, foundries, and the manufacturing of agricultural implements, gasoline engines, windmills, paper, shoes, and scales. According to the Federal Census for 1919 industrial establishments number 59 with $16,939,092 capital, and products valued at $21,105,232. Pop. (1900) 10,436; (1910) 15,125; (1920) 21,284.

Beloit College, a non-sectarian educational institution founded in 1846, in Beloit, Wisconsin. Until 1874 it offered only classical courses; a science course was established in 1892. Women were first admitted to the college classes in 1895. At present courses are given leading to the degrees of B.A. and B.S. The college has a system of accredited schools, whose students graduating with a required rank are admitted without examination. The library contains about 71,000 volumes. The Logan Museum of American Archæology and the Art Hall contain valuable collections. For recent statistics see Table of American Colleges and Universities, under the heading College.

Belomancy, bel'ō-man-si, divination by means of arrows. Nebuchadnezzar had recourse to this form of divination (Ezek. xxi. 21–22), and there is an indication of it in the story of Elisha and Joash, king of Israel (2 Kings xiii. 14–19). It was in extensive use among the Arabians.

Belon, b'lôn, Pierre (1517–64), French naturalist, was born in Soulletière, near Mans. Under the patronage of the Cardinal de Tournon, he travelled for scientific purposes in Greece, Asia Minor, Palestine, and Egypt (1546–9). He published his *Observations* during these journeys (1551–8) and wrote also on marine fish (1551) and birds (1555).

Belovar, bel'ō-vär, former county of Hungary, now included in Jugoslavia, lies between the Drave and the Save. The surface is mountainous, but the soil is fruitful. Area, 1,442 square miles. Pop. (1910) 331,385.

Bel'per, market town, England, in Derbyshire, on the Derwent River; 7 miles north of Derby. There are manufactures of cotton yarn, hosiery, linens, and nails. Coal and iron are found in the vicinity. Pop. (1921) 12,125.

Belphœbe, bel-fē'bi, a character in Spenser's *Faërie Queene,* twin sister of Amoret, typifying Queen Elizabeth as the embodiment of womanly virtue and chastity.

Bel'sham, Thomas (1750–1829), English Unitarian divine, was appointed minister of the Independent chapel, Angel Street, Worcester, in 1778, and was head of Daventry Academy from 1781 to 1789. After becoming a Unitarian, he was successively professor of divinity in the Hackney College (1789), minister of the Gravel Pit Unitarian chapel (1794), in succession to Priestley, and of Essex Street Chapel (1805–29). His published works include: *Memoirs of Theophilus Lindsey* (1812); *Elements of the Philosophy of the Human Mind* (1801); *Letters to the Bishop of London in Vindication of Unitarianism* (1815).

Belsham, William (1752–1827), English political writer and historian, brother of Thomas Belsham, devoted his life to the promotion of Whig doctrines. He wrote *Essays, Philosophical, Historical, and Literary* (1789–91), and *Remarks on the Nature and Necessity of Political Reform* (1793). His historical works were reissued in 1806 in 12 vols., under the title *History of Great Britain to the Conclusion of the Peace of Amiens.*

Belshazzar, bel-shaz'ar, a Babylonian prince. The book of Daniel (v.) makes him the son of Nebuchadnezzar, and the last Chaldæan king of Babylon, and relates the story of the feast at which he was warned of the impending fate of his kingdom by a mysterious writing on the wall. This is not, however, in agreement with other ancient records, according to which Nabonidos was the last king of Babylon. Cuneiform inscriptions discovered in 1854 would indicate that Belshazzar (or Bel-sharra-uzur) was the eldest son of Nabonidos, that he was in command of the Babylonian army, and though not himself king, was the last great defender of the Babylonian monarchy. Consult *Commentaries* on the Book of Daniel.

Belt, Great, a strait between Zealand and Fünen, Denmark, the middle channel connecting the Baltic and the Kattegat. It is about 40 miles long, and from 10 to 20 miles broad, the depth varying from 30 to 150 feet. Navigation is rendered difficult by shoals, and in winter by ice.

Belt, Little, strait between Jutland and Fünen, the west channel connecting the Baltic and the Kattegat. It is about 30 miles long, and from less than a mile to 12 miles broad, the depth varying from 30 to 180 feet. The hindrances to shipping are similar to those of the Great Belt. During the first four months of the year it is generally frozen.

Belt and Rope Transmission. Power developed by a prime mover can rarely be used directly; it must be transmitted, in many cases, to a considerable distance from its source. Belting, running upon pulleys, is a means for such transmission universally in use. It cannot be used, however, where an exact proportional movement between the driving and the driven shafts is to be preserved, because of the unavoidable slip in belts. Such movements are therefore transmitted by trains of cogged gear or chains. The length of the drive and its location determine the mechanism most suitable.

When the distance is comparatively great and the level of the driven shaft is at a considerable angle above the horizon of the driving shaft the rope drive is generally preferred.

Belts are of two general classes: leather and fabric. The fabric belts are mostly of a cotton base, treated with various substances—asphalt, rubber, balata, etc. In a class by itself is the camel's-hair belt. Steel belts have had so far a limited use. The rope used in power transmission is of cotton or manila.

Leather Belts.—First-quality belts are made exclusively of oak-tanned hides of steers; only the central part of the hide, lying 15 inches on either side of the backbone, from the shoulder to the tail, is considered good enough for the best belts. These strips are about 48 inches long when cut, and are stretched lengthwise to 54 inches. Their ends are skivered for laps of from 3½ inches for narrow belts to 6 inches for wide belts, and the joints are cemented with a glue made expressly for this purpose. After the cement has hardened the belting is again stretched at a strain of 2,500 lbs. per square inch of section. Chrome-tanned belting is especially useful where the belts must work in a temperature above 150 F. and in conditions of extreme moisture. They are thinner than oak-tanned leather and are extremely pliable; and are preferred for high-speed work on small pulleys.

Leather belts are of one, two, or three ply; and some three-ply belts have the middle layer of rawhide, which is about three times stronger than leather and much more pliable. Belts entirely of rawhide are also in use, but are less satisfactory in the long run than tanned material.

The joining of leather belts is commonly by lacing; the ends being scrupulously squared and the edges being drawn close together with rawhide lacings run through holes punched not less than half an inch back for narrow belts and further for wide belts. Five holes on each side of the joint are enough for a 4-inch belt; 9 to 15 holes for a 6-inch belt. The stitch used in lacing is shown in Fig. 1 as it appears on the outer side of the belt; on the inner side the lacing strands lie parallel to the length of the belt. An endless belt, cemented at the factory, is preferable, transmitting 15 per cent. more power than a laced belt. Patent metal clasps, shown in Fig. 2, are also in use.

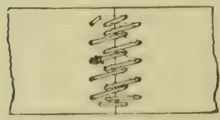


Fig. 1

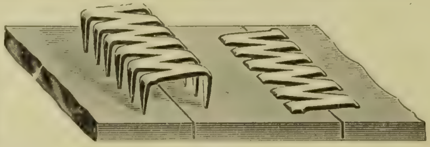


Fig. 2

Fabric Belts.—There are three types of fabric belts having cotton as a basis: solid-woven, canvas, and rubber or balata. Solid-woven belts are woven directly to the required thickness. Canvas belts are made by stitching together several layers of canvas, as many as 12 in some cases. Rubber and balata belts are made up of layers of canvas with rubber or balata gum in between. In cotton belts the fabric is almost always impregnated with asphalt or a similar substance, which at once enables them to withstand moisture and machine oil, and also lubricates them to a state of greater pliability, and through the reduction of internal friction gives them a longer life. Without this treatment they deteriorate rapidly. Stitched fabric belts are cheaper in first cost, but are less pliable than the solid-woven type.

Rubber belts are built up of several plies of canvas, one upon another, cemented together with a composition largely of rubber. A coating of rubber is then spread upon both sides and the entire belt is vulcanized. The thickness of the outer coatings is determined by the work the belt is to perform. Rubber belts are made from 4 to 12 plies in thickness. They are preferred when the belt is exposed to the weather or to steam. The balata belt is built up in the same way, using balata gum instead of rubber. Balata cannot be vulcanized, however, and will not endure exposure to heat or oils. Balata belts have a superior grip on pulleys, require no dressing, and do not deteriorate with age.

Camel's-hair belts are woven solid. They have a high coefficient of friction, endure heat and moisture, and stand up well under severe operating conditions; but are expensive.

Steel Belts.—Steel band belts are made from a specially prepared charcoal steel, rough-rolled when hot, and brought to the required thickness and width by cold working. For these belts it is necessary to cement a cork-surfaced canvas face on the pulleys used. A steel belt needs to be only one-third the width of a leather belt for the same power. Steel belts are replacing rope drives in some of the British cotton mills and saving considerable power and time formerly spent in repair.

Rating of Belts.—Belts are rated by the manufacturer as capable of transmitting a certain horsepower. These ratings are calculated on driving and driven pulleys of the same diameter, and an arc of belt contact of 180°. In such case the power transmitting capacity of a belt is directly proportional to its width. When the pulleys are of different diameter, the arc of contact on the smaller pulley is less than the rating arc and a wider belt is needed to transmit a given power.

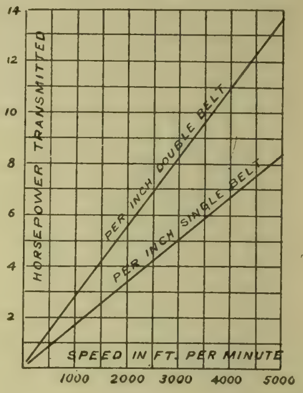


Fig. 3

The general formula for determining the power rating of a belt is $H = \frac{SVW}{33000}$ where H is the horsepower, S the effective belt pull in pounds per inch of width, V the belt velocity, and W the width of the belt in inches. The variable factor is the difference between the tensions on the tight and slack sides; and this is affected by belt velocity, arc of pulley contact, and belt thickness (as related to pulley diameter).

Belt Tension.—The tension of a belt should be just sufficient to prevent loss of power through slip. To strain a belt tighter than this is to shorten its life, cause hot bearings, and increase wear of the bearings. The tension when the belt is at rest should be close to 100 pounds per inch of width. The tension varies inversely as the sag. While recent practice is to run belts at a higher tension than formerly, it is best to use such dressing on the belt as will permit it to run 'easy,' yet without slip. Tighteners bring strain on the journals and should not be used; an idler set close to the smaller pulley will take up slack and increase power by increasing the arc of contact. Rubber belts may be run with higher tension than leather belts, but only with greater wear of the bearings.

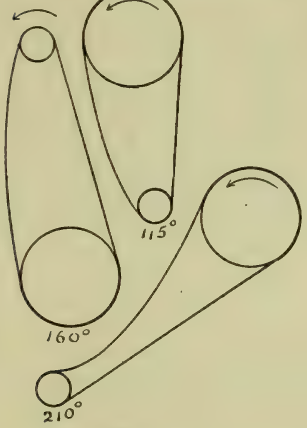


Fig. 4

Pulleys.—The life and efficiency of belts depend largely on the size of the pulleys, which should be as large as space permits without raising the belt velocity to more than 4,500 feet per minute. The face of the pulley should be wider than the belt by an inch for each 4 inches of belt width, and be slightly crowned—about 1/8 inch for each 12 inches width of face.

Wood pulleys afford a better grip than either cast-iron or steel pulleys; but the latter may be improved by boring holes through the face, or by setting cork inserts in staggered pits in the face, or by covering the face with rubber or leather cemented on. Solid cast-iron pulleys are usually limited to a face speed of 3,000 feet per minute, and split pulleys to 1,800 feet. Split steel pulleys are run up to 6,000 feet per minute.

Speed of Belts.—Critical speed is reached for most belts at 5,000 feet per minute; above that the slip is so great that the power transmitted is lessened. The best belt velocity is expressed by the formula, $v = 5.27\sqrt{s}$, where v is the speed in feet per minute and s the tensile strength of the belt in pounds per square inch of section. For rubber belts the speed should be held down to below 4,000 feet per minute. Fig. 3 shows graphically the effect of speed upon horsepower delivered.

Power Transmission.—The flesh side of a leather belt should not be run next the pulley face. When a belt is new, the flesh side gives the best traction for a few days, but later transmits only 60 per cent. as much as the hair side. A thin belt transmits less power than a thick one. A heavy single leather belt pulls 55 lbs. per inch of width; a heavy double, 88 lbs.; a heavy triple, 110 lbs. The efficient horsepower equals this pull times the speed in feet per minute times the belt width, divided by 33,000. Light belts would give 80 per cent. of this horsepower, and medium belts, 90 per cent. These figures are based upon pulleys of equal arcs (180°) of contact; the effect of other arcs may be gauged by reference to the three types of drive shown in Fig. 4, where A, B, and C are the driven pulleys. At 600 feet per minute a rubber belt will transmit one horsepower for each inch of width. A four-ply rubber belt is equivalent to a single leather belt; a six-ply thickness to a double leather belt. A rubber belt must be watched to see that it does not slip excessively. Slip not only wastes power but shortens the life of the belt. A leather belt will save its cost above a rubber belt in three years.

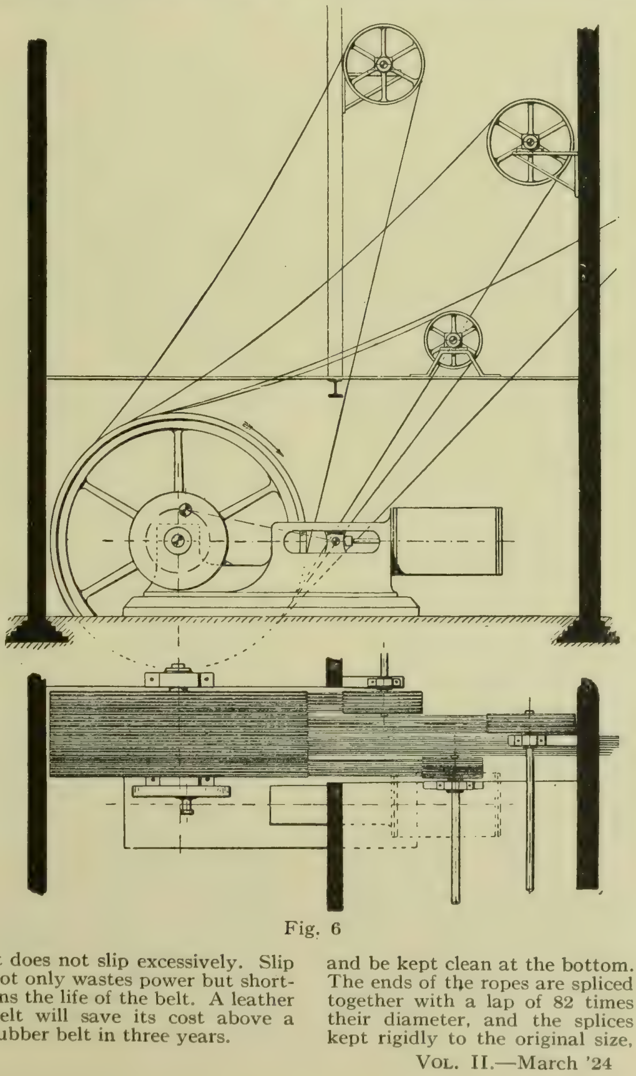


Fig. 6

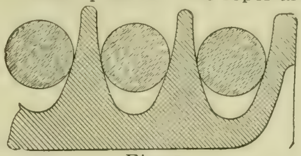


Fig. 5

Rope Drives.—Cotton ropes are used almost altogether in rope drives, manila fibres being too stiff and brittle for long wear and requiring frequent stoppages to take up slack. The ropes are run on pulleys with grooved faces; the size of the rope determines the size of the groove, but the angle is always at 40°. The rope grips by pinching in the groove, as shown in Fig. 5. The sides of the grooves must be free from the slightest roughness and be kept clean at the bottom. The ends of the ropes are spliced together with a lap of 82 times their diameter, and the splices kept rigidly to the original size, smooth and free from lumps. The diameter of the smallest pulley should be at least 30 times the diameter of the rope for ordinary speeds. For low speeds this figure may be reduced: a half-inch rope will run well on a 4-inch pulley at 1,000 feet per minute, and an inch-rope on an 18-inch pulley at 2,000 feet per minute.

A rope drive will not work at all unless accurately installed. A small number of large ropes is better than a greater number of small ones. Every rope added decreases the proportional power transmitted. The following table shows the horsepower that is transmitted by cotton driving ropes at different speeds:

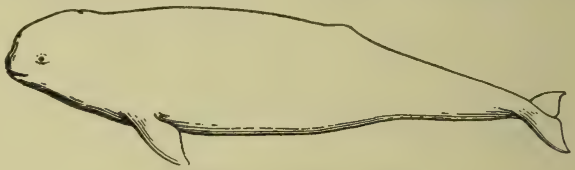
Velocity of Rope in Feet per Min.	Horsepower transmitted.				
	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.
1,000	4.5	7.1	10.2	14.0	18.2
2,000	9.1	14.2	20.5	28.0	36.5
3,000	12.6	19.8	28.4	38.7	50.4
4,000	14.8	23.2	33.4	45.5	59.4
5,000	15.4	24.1	34.6	47.1	61.5

Two systems are employed: the multiple, and the continuous. In the former each rope on a pulley forms an independent belt; in the latter only one rope is used, and it is carried continuously around all the pulleys, with but one splice. The slack, which is very considerable in a continuous rope, is taken up by a movable idler pulley placed in a bight of the rope, and so weighted as to keep a proper strain on the entire rope. Fig. 6 shows in plan and elevation the disposition of a 30-rope drive.

Bibliography.—Consult C. G. Barth's *Transmission of Power by Leather Belting*, in *American Society of Mechanical Engineers Journal*, Vol. XXXI. pp. 43–78; H. E. Collins' *Shafting, Pulleys, Belting and Rope Transmission;* R. T. Kent's *Power Transmission by Leather Belting* (1916); W. G. Dunkley's *Belts for Power Transmission* (1920).

Beltane, bel'tăn, BELLTAINE, or BELTINE, a word found in Scotland, Ireland, Cumberland, and Cornwall, applied in a secondary sense to the first of May (or, in some districts, to St. John's Eve and St. Peter's Day), but originally used to denote the great fire festivals which marked the beginning of summer. Traces of human sacrifices at them were particularly clear. Beltane cakes were baked for the occasion, and used in casting lots to determine which of the company was to be sacrificed as the Beltane witch, the death penalty being mitigated into a mild form of social outlawry. Songs and dances, known as Beltane games, were also an accompaniment of the ceremony. The antiquity of these observances is further indicated by the fact that the bonfire was kindled by the primitive method of 'forced' or 'need' fire (Gael. *tein-eigin*)—*i.e.* from combustion produced by the violent friction of two pieces of wood. The Beltane rites continued to linger on into the 19th century in certain parts of the British Isles.

Belton, city, Texas, county seat of Bell county, on the Leon River and the Missouri, Kansas and Texas of Texas, and the Gulf, Colorado and Santa Fe Railroads; 40 miles southwest of Waco. It is the seat of Baylor Female College (Baptist), and has a county court-house and Carnegie library. The chief industries are connected with the export of cotton and marble, also flour, lumber, and brick. Pop. (1910) 4,164; (1920) 5,098.



Beluga, or White Whale

Beltrami, bel-trä'mē, EUGENIO (1835–1900), Italian mathematician, was born in Cremona and taught mathematical physics in the University of Rome and other Italian universities. He is remembered for the important departures which he made in the study of geometry. His was the theory that non-Euclidian geometry deals with surfaces of constant negative curvature. He published *Saggio di interpretazione della geometria non-euclidia* (in *Giornale Matematica VI.*), and other valuable papers on mathematics, physics, electricity, magnetism, and elasticity.

Beluchistan. See BALUCHISTAN.

Beluga, be-lo͞o'ga, or WHITE WHALE (*Delphinapterus leucas*), a cetacean allied to the dolphins, and especially to the narwhal (q. v.). The beluga is from eight to ten feet in length, is white in color, and is found in the Arctic seas, but occasionally strays southward. In spring it chases the herring and other fish, upon which it preys, into bays and shallow waters, where it is easily killed by the Eskimos.

Belur-tagh, or BOLOR-TAGH. See PAMIRS.

Be'lus, in Greek mythology, son of Poseidon and Libya, and father of Ægyptus and Danaus. He was supposed to have founded Babylon.

Belvedere, bel-vi-dēr', a summer-house or kiosk on rising ground, or a room built above the roof of a house for the purpose of viewing the surrounding country. In France the term is also used for a summer-house in a garden. Two important structures are known by this name—the Court of the Belvedere in the Vatican, which forms part of the sculpture gallery, and a palace near Vienna, built in 1725 for Prince Eugene of Savoy.

Belvidere, city, Illinois, county seat of Boone county, on the Kishwaukee River, and the Chicago and North Western Railroad; 75 miles northwest of Chicago. It has a public library, court-house and city park. Belvidere is a manufacturing centre, producing sewing machines, automobiles, boilers, bicycles, razors, screen doors, flour, and dairy products. Pop. (1910) 7,253; (1920) 7,804.

Belvi'sia (*Napoleona imperialis*), an African plant closely allied to the mangrove (q. v.), with flowers of a brilliant red, blue, or white color, and an edible fruit resembling the pomegranate.

Belvoir Castle, bē'ver, Leicestershire, England, the seat of the Duke of Rutland. The original building was a fortress, erected soon after the Conquest by Robert de Todeni. The present pile is a modern castellated, hollow quadrangle. It contains a noble apartment called the Regent's Gallery, 127 feet long. The castle commands a view of thirty miles over the picturesque Vale of Belvoir.

Belzoni, bel-tso'nē, GIOVANNI BATTISTA (1778–1823), Italian Egyptologist, was born in Padua. In 1803 he went to England, and for some time supported himself and his English wife by street acrobatic performances; but with an engagement at Astley's Amphitheatre his circumstances improved, and he devoted much time to studying mechanics. In 1812 he began to travel, visiting Portugal, Spain, and Egypt, where he designed a hydraulic machine for raising the waters of the Nile. He then visited Thebes, and removed the Young Memnon statue, which he sent to London. He investigated the temple of Edfu, visited Elephantina and Philæ, discovered the temple of Abusimbel, worked at Karnak, and found a magnificent tomb in the Bibân-el-Moluk. He was the first to enter the second pyramid at Gizeh, and to visit the oases west of Lake Moeris. In 1821 he published his *Narrative of Recent Discoveries in Egypt and Nubia*. He then attempted to reach Timbuktu, but died on his way inland from Benin.

Bem, Joseph (1795–1850), Polish general, was born in Tarnow, Galicia. He took part in the Polish rebellion of 1830–31, distinguished himself at Ostrolenka, and after the fall of Warsaw (1831) took refuge in Paris. In 1848, at the head of 10,000 Hungarian insurgents, he overran Transylvania, but was defeated by the allied Austrians and Russians at Schässburg on July 31, 1849, and again at Temesvar on Aug. 9, 1849. Thereafter he fled to Turkey, adopted Islamism, and entered the Turkish army, receiving the title of Amurat Pasha. He was sent to Aleppo, in 1850, to suppress an Arab attack upon the Christian population, and there died of fever.

Bemba, lake. See Bangweolo.

Bembatoka, Bay of. See Bombetoke.

Bemberg, bäṅ'bâr', Henri (1861–), French composer, was born in Paris, of Argentine parents. He was educated at the Paris Conservatoire under Dubois and Massenet, whose influence is apparent in his work. Among his compositions are *La Mort de Jeanne d'Arc* (1886), a cantata for chorus and orchestra; *Le Baiser de Suzon* (1889), a comic opera; and *Elaine* (1892), an opera. He wrote numerous songs, and *La Ballade du Désespéré*, a recitative poem with musical accompaniment.

Bem'bex, a genus of hymenopterous insects specially notable for their burrowing propensities, generally known as 'sand wasps.' They are found chiefly in warm climates, where they infest sandy banks, on which the females deposit their eggs, provide food for the larvæ, and then close up the holes with earth.

Bem'bo, Pietro (1470–1547), Italian humanist, was born in Venice. He learned Greek under Laskaris, and became a leading member of the academy of Aldus Manutius at Venice. From 1513 to 1521 he was secretary to Pope Leo x., and in 1539 was made a cardinal, receiving in 1541 the see of Gubbio, and later that of Bergamo. His works greatly contributed to the creation of a good style, both in Latin and in Italian. Among them are: *Epistolæ* (1535); *Rerum Veneticarum Libri XII.* (1551), a history of Venice from 1487 to 1513; *Carmina* (1533), clever imitations of Petrarch; *Gli Asolani* (1505), philosophical talks about love; and *Rime* (1530).

Bem'bridge Beds, a division of the Oligocene or Upper Eocene strata, principally developed in the Isle of Wight and in Hampshire, England.

Bemidji, bē-mij'i, city, Minnesota, county seat of Beltrami county, on Bemidji Lake, and on the Great Northern, the Minneapolis, Red Lake and Manitoba, the Minneapolis, St. Paul and Sault Ste. Marie, and the Minnesota International Railroads; 200 miles northwest of Minneapolis. It is a summer resort and the seat of a State normal school. Lumbering is the chief industry. Pop. (1910) 5,099; (1920) 7,086.

Be'mis, Edward Webster (1860–), American economist and appraisal engineer, was born in Springfield, Mass., and was educated at Amherst College (A.B. 1880; A.M. 1884) and Johns Hopkins University (PH.D. 1885). He served as professor of history and political economy in Vanderbilt University (1889–92); associate professor of political economy in the University of Chicago (1892–5); and professor of economics and history in Kansas State Agricultural College (1897–9). From 1901 to 1909 he was superintendent of the water department of Cleveland, Ohio, and in 1910 became a special investigator, appraising a number of public utilities for city and State commissions. His publications include *Municipal Monopolies* (1899) and papers on municipal government and economic subjects.

Bemis Heights, Battle of. See Saratoga, Battles of.

Ben (Hebrew and Arabic 'son'), often used in connection with the father's name to form personal names and patronymics—thus, Ali Ben Hassan, 'Ali, son of Hassan'; Benoni, 'son of my pain'; Benjamin, 'son of the right hand.' The Arabs, Persians, and Turks often make the prefix into *Ibn* (*Ebn*); the Jews, under Arabic influences, use *Aben, Aven*, as in Aben Esra.

Ben, or Beinn, the Gaelic form (Welsh *Pen*) of a Celtic word signifying 'mountain' or 'mountain head.' It occurs in the names of a great many mountains and places in the British Isles, as *Ben* Nevis, *Pen*nigant, *Pen*zance; it appears, also, in European Continental names, as the *Pen*nine Alps.

Ben, Oil of. See Moringa.

Benacus Lacus. See Garda.

Benadir, ben-à-dēr', administrative division of Italian Somaliland, East Africa, extending from the Juba north to Meghed. It is officially known as Southern Italian Somaliland.

Benalla, town, Victoria, Australia, in Deltatite county; 110 miles northeast of Melbourne. It is the centre of an agricultural and fruit-growing district. Pop. 3,100.

Benares, ben-ä'rez *or* -rēz, native state, United Provinces, India, formed in 1911 from the parganas of Bhadohi and Kera Mangraur and the tract comprising the Fort of Ramnagar and its appurtenances. Area, 870 square miles. Pop. (1921) 362,860.

Benares (*Banáras*), the most sacred city of the Hindus, and one of the principal towns of the United Provinces, India, is situated on the left bank of the Ganges; 429 miles northwest of Calcutta, with which it is connected by rail. It skirts the Ganges for 3 miles, and the high bank is lined with broad flights of stairs or *ghats*, leading to innumerable temples and large substantial houses, which present toward the river an imposing array of towers and pinnacles and richly carved façades. The river, which takes a great crescent-like sweep at this point, is crossed by the Dufferin Railroad Bridge of sixteen spans, with a total length of 3,518 feet.

Notable buildings are the Nepalese temple, Aurungzebe's mosque, with two minarets 147 feet high; Raja Jai Singh's observatory; the Gopal Mandir, wealthiest of all the temples; the Bisheswar or Golden Temple of Siva, the holiest of all; and the famous Durga Temple, popularly called the Monkey Temple. Other points of special interest are the well of Mani Karniki, formed of Vishnu's sweat, to bathe in which is to be cleansed of all sin for time and eternity; the Juana-vapi, or 'pool of Knowledge'; and the Lat Bhairo, a portion, it is believed, of one of Asoka's pillars. At the Burning Ghat the bodies of Hindus are reduced to ashes.

Sikrol, the European quarter of Benares, lies to the northwest of the native city. Here, among other public buildings, are a college established by the British government in 1791 for the study of Sanskrit, the King Edward VII. hospital, and a town hall. The Central Hindu College, founded in 1898 by Mrs. Annie Besant (q.v.), has been merged in the new Benares Hindu University, the cornerstone of which was laid in 1916.

Benares draws immense revenues from the thousands of pilgrims who visit it from all parts of India. It has a considerable trade, not only in country produce, but in English goods, jewelry and precious stones, sugar, saltpetre, and indigo. Its brassware, kinob or cloth of gold, lacquered toys, silks, shawls, and embroideries are famous.

A city of great antiquity, Benares (Sanskrit *Varanasi*) was for 800 years the centre of the Buddhist faith. In the fourth century B.C. it reverted to the ancient faith of the Hindus, of which it has ever since been the metropolis. Pop. (1901) 209,331; (1911) 203,804; (1921) 198,447. Consult Rajani Rangan Sen's *The Holy City* (1912).

Benbecula, an island of the Outer Hebrides. See Hebrides.

Benbow, ben'bō, John (1653–1702), British admiral, was born in Shrewsbury, England, and first distinguished himself as captain of a merchantman in a bloody action with Sallee pirates (1686). He commanded the fleet in the battle off Beachy Head in 1690, and at Barfleur and La Hogue in 1692. In 1693–4 he was in charge of a squadron which burned Dieppe, bombarded Havre and Calais, and otherwise harried the French coast. In 1696 he became rear-admiral, and in 1698 took command of a force in the Channel. In 1699 he commanded in the West Indies. On his return to England, the following year, he was appointed vice-admiral. In 1702 he was again sent to the West Indies, where the French, under Ducasse, were active against the English. He attacked the enemy on Aug. 19, and although deserted by some of his captains, carried on a running fight for five days. The battle lost, he sailed for Jamaica, where he died, shortly afterward, from his injuries.

Bench, a collective term for the judiciary, as in the phrase 'bench and bar,' to denote the judges and practising lawyers of a given jurisdiction. Specifically, the term is also in use to designate a judge, or, more commonly, a court composed of several judges acting together, as in the phrases the 'supreme bench,' the 'circuit bench,' the 'full bench.' In English judicial history the two greatest courts of common law were for centuries known respectively as the 'King's (or Queen's) Bench' and the 'Common Bench,' the latter being better known under its ancient title, the Court of Common Pleas. See Banc, Sittings in.

Bencher, a member of the governing body of any of the Inns of Court (q.v.).

Bench Warrant, an order issued to enforce compliance with some decree of a court, or to arrest an individual for contempt of court.

Benckendorff, Count Alexandre (1849–1917), Russian diplomat, was educated in Paris and entered the diplomatic service as an attaché in Italy. He subsequently served as secretary of legation in Vienna, minister to Denmark (1897–1903), and ambassador to Great Britain (1903–17). He handled with skill the Dogger Bank incident, and had a large share in realizing the Triple Entente.

Bencoo'len, or Benkulen (Dutch *Benkoelen*), seaport town, Dutch East Indies, on the west coast of Sumatra, in 3° 47′ s. lat. The site is low and swampy, and most of the houses are built on bamboo piles. Vessels anchor 3 miles from the town. Fort Marlborough, the residence of the governor, was erected in 1714. Pop. 7,700.

The ***Residency of Bencoolen*** stretches along the Sumatran coast from 2° 30′ to 5° 58′ s. lat., and embraces an area of 9,995 square miles, with a population of over 200,000. It produces tobacco, coffee, rattan, rubber, edible birds' nests, and gold and silver.

Bend, in heraldry one of the honorable ordinaries, is a figure with parallel edges, extending diagonally right across the shield from the dexter chief to the sinister base. Its size (*i.e.*, width) is, if charged, one-third of the field; if uncharged, one-fifth. It is supposed to represent the scarf or shoulder belt of a knight. The bend has three diminutives—the *bendlet*, which is (in width) half the bend; the *cost* or *cotice*, half the bendlet; and the *ribbon*, of the same width with the cost, but couped at the ends.

The *bend sinister* is the bend dexter reversed—*i.e.*, sloping from the sinister chief to the dexter base. It has two diminutives—the *scarp* (half the bend) and the *baton* (half the scarp, and couped at the ends).

Bendy, one of the varied fields, is formed by dividing the field into an equal number of bends of two alternating tinctures. *In bend*, or *per bend*, is said of charges or partition lines when placed in the direction of a bend. See Heraldry.

Benda, Georg (1721–95), member of a notable musical family, was born in Jungbunzlau, Bohemia, and was distinguished as a pianist, violinist, and composer. He produced several operas and cantatas, including *Ariadne auf Naxos* and *Medea*, and is said to be the originator of that illustrative form of music which accompanies spoken words.

Bendemann, ben'de-män, Eduard (1811–89), German painter, was born in Berlin. In 1832 he produced *The Jews in Babylon* (Cologne Museum), which excited wide attention; and in 1835, *Jeremiah on the Ruins of Jerusalem*. In 1838 he was appointed professor of the academy at Dresden, and was entrusted with the painting of a series of frescoes at the royal palace. This work, upon which he was engaged till 1855, depicts *The Progress of the Human Race*. Later pictures include: *The Carrying Away of the Jews into the Babylonian Captivity* (Berlin) and *Penelope* (Antwerp).

Ben'der, or Benderi, town, Roumania, in Bessarabia, on the River Dniester, and on the railway from Tiraspol to Jasi (Jassy); 62 miles northwest of Odessa. The principal industries are the manufacture of bricks, stoneware, paper, and leather, agriculture, fishing, and mining. Pop. 35,000.

Bender Abbas, ben'der äb'bȧs, or Bandar Abbas (formerly *Gombrun* or *Gombroon*), seaport, Persia, in the province of Kerman, on the north side of Ormuz Strait; 12 miles northwest of Ormuz. It has trade with Europe and India, chiefly in British vessels. Exports include dates, almonds, raisins and other fruits, drugs, raw cotton, dyeing materials, and wool. Pop. 8,000.

Bender Gez, seaport, Persia, in the province of Astrabad, is situated at the southeast corner of the Caspian Sea; 20 miles west of Astrabad. Its exports are valued at $1,500,000 annually, two-thirds of this amount representing raw cotton.

Bendigo, ben'di-gō (formerly *Sandhurst*), Victoria, Australia, capital of Bendigo county, and chief town of a large district devoted to gold mining and farming; 101 miles by rail northwest of Melbourne. Pop. (1921) 25,682.

Bendire, ben-dē'rē, Charles Emil (1836–97), American ornithologist, was born near Darmstadt, Germany. He went to America in 1852, enlisted in the U. S. Army in 1854, served through the Civil War, and retired as a captain in 1886. Much of his time was passed in the West, where he devoted himself to ornithology, and made a large collection of nests and eggs, now in the U. S. National Museum. His chief work, *The Life Histories of North American Birds* (1892–6), was left unfinished.

Bends. See Caisson Disease.

Bendzin, ben'jēn, town, Poland, in the government of Piotrkow; 100 miles southwest of Lodz. It has zinc works and coal mines. Pop. 46,000.

Benedek, bā'ne-dek, Ludwig von (1804–81), Austrian general, was born in Odenburg, Hungary. He entered the army in 1822, and distinguished himself at Mortara and Novara (1849) in Italy, and at Raab, Komorn, and Uj-Szegedin (1849), in Hungary. He won further credit in the Italian campaign in 1859, and at Solferino drove back the Piedmontese with great slaughter. He was appointed governor of Hungary in 1860, and subsequently commander-in-chief at Venice. In 1866 he commanded the northern Austrian army against Prussia;

but shortly after the disastrous defeat of Sadowa he was superseded, and court martialled.

Benedetti, bā-nā-det′tē, Vincent, Count (1817–1900), French diplomat, was born in Bastia, Corsica. He was ambassador at Turin in 1861, and at Berlin in 1864. He drew up the draught of a secret treaty between France and Prussia in 1870; and it was he who at Ems demanded of King William a guarantee that no Hohenzollern prince should be allowed to accept the Spanish crown, thus playing an important rôle in the precipitation of the Franco-German War (q. v.). In *Ma Mission en Prussia* (1871) and *Studies in Diplomacy* (Eng. trans.) he defends his own policy.

Benedicite, or the Song of the Three Children, a canticle from the Apocrypha forming part of the prayer of Abednego in the fiery furnace. It was sung in the Christian Church as early as the time of St. Chrysostom, and is used in the Anglican Church at the morning service when the Te Deum is not sung.

Benedict, the name of fifteen popes and one anti-pope. The most important are:

Benedict viii. (1012–24) was driven from Rome by the antipope Gregory, but in 1014 was restored to the papal chair by the Emperor Henry ii. He distinguished himself as a reformer of the clergy, and interdicted, at the synod of Pavia, both clerical marriage and concubinage.

Benedict ix., a nephew of Benedict viii., obtained the papal throne by simony in 1033, at the age of eighteen; but in 1038 the Romans rose in indignation, and banished him. He was several times reinstalled, and as often deposed.

Benedict xiii. is a title assumed by two popes, *Peter de Luna*, a Spaniard, chosen by the French cardinals in 1394, and recognized only by Spain and Scotland up to his death in 1424; and *Vincenzo Marco Orsini* (1724–30), a learned and well-disposed man.

Benedict xiv. (1740–58) (Prospero Lambertini), a most worthy pontiff, founded chairs of physics, chemistry, and mathematics in Rome; revived the academy of Bologna, and instituted others; dug out the obelisk in the Campus Martius, constructed fountains, and rebuilt churches; caused the best English and French books to be translated into Italian; and encouraged literature and science.

Benedict xv. (1914–22) (Giacomo Della Chiesa) was born in Pogli, near Genoa, in 1854, was educated in Rome, and was ordained in 1878. From 1883 to 1887 he was at Madrid as secretary of the Nunciature and assistant to Cardinal Rampolla, after which he returned to Rome and held various positions in the secretariate of state. In 1900 he was made a prelate; in 1901 became consultor of the Holy Office; in 1907 was created archbishop of Bologna; and in May, 1914, cardinal. On the death of Pope Pius x., Cardinal Della Chiesa was elected to succeed him (Sept. 3, 1914), taking the title of Benedict xv.

Benedict's pontificate, beginning very shortly after the opening of the Great War, covered one of the most critical periods in the history of the world. His position was one of extreme difficulty, having to deal with Catholics on both sides of the great conflict, and maintain, as far as possible, a practical neutrality. He made repeated efforts to end the war, issuing his first peace encyclical one week after his coronation. He appointed Feb. 7, 1915, throughout the Catholic world as a day of prayer for the restoration of peace and good will. Other efforts to bring about peace were made in July, 1915, February, 1916, and August, 1917. He sent Monsignor Cerratti as an observer at the Peace Conference and after the Treaty of Versailles declared that as the head of the Church he would do all in his power to support the decisions of the delegates. During his pontificate, relations with France and Portugal were restored, and steps were taken for a more intimate representation in the British Empire. His influence upon Italian politics was constructive, and in January, 1919, he freed Italian Catholics from all inhibition against participating in the political movements of the country.

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Pope Benedict XV.

Benedict, surnamed Biscop (*c.* 628–690), an Anglo-Saxon monk who journeyed several times to Rome, whence he brought books, pictures, and relics for the monastery which he afterward founded (674) at Wearmouth. He erected (682) another religious house at Jarrow, 6 miles distant. Leland ascribes to him *Concordantia Regularum*, a commendation of the rules of St. Benedict.

Benedict, St. (480–543), founder of Western monasticism, was born of a wealthy family at Nursia, near Spoleto, Italy. At the age of fourteen he retired to a deserted country lying on a lake, hence called *Sublaqueum* (now Subiaco), where, in a cavern (which afterward received the name of the Holy Grotto), he dwelt for three years, until his fame spread over the country. He was appointed abbot of a neighboring monastery, but left it for a stricter mode of life. In the course of a few years numbers flocked after him, including the sons of wealthy Romans and uncivilized Goths, and he was able to found twelve monasteries. After some time he sought (about 529) another retreat, and, accompanied by a few followers, founded the monastery of Monte

Cassino, near Naples, which became one of the richest and most famous in Italy. Here he had an interview with Totila, king of the Goths, whom he sternly reproved. In 515 he wrote his *Regula Monachorum*, in which he aimed, among other things, at repressing the irregular and licentious life of the wandering monks by introducing sterner discipline and order, and which eventually became the standard rule of the Western monastic orders.

Benedict, SIR JULIUS (1804–85), musician and composer, was born in Stuttgart, Germany, where his father was a Jewish banker. He was a favorite pupil of both Hummel and Weber, and held appointments as conductor at Vienna (1824) and Naples (1826). After becoming known as the composer of several operas, Benedict, acting on the advice of Malibran, went to London (1835), and was conductor at Covent Garden, Drury Lane, the Monday popular concerts, and various musical festivals. During this period he composed *The Gypsy's Warning* (1838), *The Brides of Venice* (1844), and *The Crusaders* (1846). In 1850–51 he acted as concert director during a successful tour of the United States by Jenny Lind. In 1860 he produced a cantata, *Undine;* but his *Lily of Killarney*, first given in 1862 at Covent Garden, was his greatest operatic success. Other productions include a cantata, *Richard Cœur de Lion* (1863); an opera di camera, *The Bride of Song* (1864); the cantatas *St. Cecilia* (1866) and *Graziella* (1882); and the fine oratorio, *St. Peter*, written for the Birmingham Musical Festival (1870), which was perhaps his masterpiece. He was knighted in 1871.

Benedictine. See LIQUEURS.

Benedictines, an order of monks and nuns who follow the rule of St. Benedict (q. v.). In Benedict's lifetime his disciple, St. Placid, spread the order in Sicily, and St. Maurus in France. St. Gregory the Great was the first (590–604) of the fifty Benedictines who have occupied the papal throne, a list which includes such names as Leo IV., Gregory VII., Pius VII., and Gregory XVI. St. Augustine, the disciple of Gregory the Great, brought the Benedictine rule to England, and became the first of a long list of Benedictine archbishops of Canterbury. The English Benedictine, St. Boniface, preached the faith in Germany, and founded there the great abbey of Fulda. Ansgar, the apostle of Denmark; Willibrord, of the Frisians and Dutch; Adalbert, of the Bohemians; and Casimir, of the Poles, were all Benedictines; while Bede and Anselm in England; Isidor, Leander, and Ildefonsus in Spain; Peter Damiani in Italy, and Bernard in France, are other names which illustrate the strength of this order.

As early as 1354 the order numbered 24 popes, 200 cardinals, 7,000 archbishops, 15,000 bishops, 1,560 canonized saints, and 5,000 holy persons worthy of canonization—a number since increased to 40,000. It then possessed 37,000 monasteries, 20 emperors, 10 empresses, 47 kings, 50 queens, and an immense number of royal and noble persons. In the fifteenth century there were 15,107 Benedictine monasteries. The Reformation left not more than 5,000; and at the present day the list would not exceed 800. During the past century the order has spread widely in the United States, where there are eight large abbeys and a number of smaller establishments. The congregation of St. Maur in France is pre-eminent for literary fame (see MAURISTS). Other famous monasteries are St. Denis and Fontanelle in France; Bobbio in Italy; Fulda, Corvei, St. Gall, and Reichenau in Germany; Wearmouth and Jarrow in England.

The ***Rule of St. Benedict*** is a modification of that of the Eastern ascetics, St. Basil, Cassian, etc. It was the first to introduce *Stability*, or the binding of the monk to a permanent abode in a monastery, and in the practice of monastic life till death. This is the first of the Benedictine's three vows; the second is *Conversion of Manners—i.e.*, the striving after perfection of life; and the third, *Obedience according to the Rule*, by the tenor of which the monk is bound to chastity, to the renunciation of private property, to retirement from the world, to the daily and public solemnization of the divine office, and to a life of frugality and labor under filial obedience to the abbot.

The Benedictine habit consists of a tunic and scapular, over which is worn a long full gown called a *cowl*, with a hood to cover the head. The color is not specified in the rule, and it is conjectured that the early Benedictines wore white as being the natural color of undyed wool. For many centuries, however, black has been the prevailing color, whence the term 'black monk' has come to mean a Benedictine in general, though colors may differ in different congregations—*e.g.*, the Camaldolese, the Cistercians, and Olivetans wear white, and the Silvestrines blue. Consult Cardinal Newman's *Mission of St. Benedict;* Montalembert's *Monks of the West* (Eng. trans. by Gasquet).

Benediction, a solemn invocation of the divine blessing upon men or things. In the Protestant churches the Benediction is the prayer for blessing pronounced by the minister at the close of divine service, usually either in the words of 2 Cor. xiii. 14, or in the form given at the end of the communion service of the Church of England. Num. vi. 24-26 and Heb. xiii. 20-21 are also employed.

In the Roman Catholic Church a priestly benediction has been defined as a formula of imperative prayer, which transmits a certain grace or virtue to the object over which it is pronounced. Priests having special faculties for the purpose may bless crosses and rosaries, which only, when so blessed, impart the papal indulgence to those who use them. The *Benediction of the Blessed Sacrament*, a comparatively modern rite, is a solemn function in which, after certain canticles and antiphons have been sung in presence of the Sacred Host, exposed above the altar, the priest, mantled with the veil, in silence makes the sign of the cross with the monstrance held over the people.

Benedictus (Latin 'blessed'), the hymn of Zacharias (Luke i. 68–79), used from ancient times in the services of the Church. The term is also applied to a part of the service of the mass, beginning '*Benedictus qui venit*' (Blessed is he who comes).

Benedix, (JULIUS) RODERICH (1811–73), German playwright, was born in Leipzig. From 1842 to 1861 he was mainly at Cologne, as director of the Stadttheater, teacher of dramatic art, and man of letters; from 1861 to his death he lived at Leipzig. His earliest success was *Das bemooste Haupt* (1841); other plays are *Doctor Wespe, Eigensinn, Das Gefängniss, Die Zärtlichen Verwandten*, and *Mathilde*. He was a master of the comedy of situation, and pictured German middle-class life.

Benefice, the term applied to an ecclesiastical living in the Church of England, and, in a more general sense, to any form of ecclesiastical preferment in that Church. A clergyman obtains a benefice by presentation by the patron of the advowson, or, if the patron is a bishop, by collation, followed in each case by admission by the bishop, institution, and induction. A benefice may be lost by simony, the possession of more livings than is lawful, or continued disobedience to authority.

In feudal law the term was employed in a wider sense to include any gift of lands made by a lord to his vassal, to be held by the latter on condition of military or other service. In this use the term was superseded by the word feud or fief, which survives in 'fee.'

Beneficiary, ben'*e*-fish'i-a-ri, strictly, the holder of a benefice (q. v.); in the law of trusts, the *cestui que trust*, or person for whose benefit the trust fund is created. It is in an analogous sense that the term is employed to describe the person entitled to the benefits of a policy of life insurance. See TRUST.

Benefit of Clergy, a privilege claimed by the mediæval church, whereby the clergy, when charged with crime, were permitted to stand trial in ecclesiastical rather than secular courts. In England this privilege was extended in 1330, to include all persons who could read, *i.e.* to all 'clerks.' In 1531, persons below the rank of subdeacons were excluded from it in the case of the more serious felonies; at the beginning of the sixteenth century it was enacted that certain offenses should be 'without benefit of clergy'; and in 1827 the privilege was abolished. In the early days of the American colonies there were a few cases of its use, but in 1790 it was forbidden by Act of Congress.

Benefit Societies. See FRATERNAL SOCIETIES.

Beneke, bā'n*e*-k*e*, FRIEDRICH EDUARD (1798–1854), German philosopher, was born in Berlin, and succeeded Hegel as professor of philosophy there. His *Erkenntnislehre*, or 'Theory of Knowledge' (1820), in which he opposes the philosophy of Hegel and Kant, shows a strong sympathy with the Scottish metaphysicians. In his view the basis of all philosophy consists in empirical psychology, and mental phenomena are to be treated by the methods of natural history. Consult his *Lehrbuch der Psychologie als Naturwissenschaft* (1833; 4th ed. 1877); also *Memoirs*, in German, by J. Friedrich and by Gramzow; Brandt's *Beneke, the Man and His Philosophy.*

Benes, ben-esh', EDUARD (1884- died Sept 3, 1948 Czechoslovakian statesman, was born in Kozlany, worked his way through the University of Prague, and studied also in France. From 1908 to 1913 he was instructor in sociology at the University of Prague, and after the outbreak of the Great War organized the so-called Czech mafia, an underground society working in the interest of the Allies. In 1915 he fled to Switzerland to escape arrest by the Austrian police, and joining Professor Masaryk (q. v.) in Paris, organized with him the Czechoslovak National Council. When the Czechoslovak Republic was proclaimed (1918), Benes was made foreign minister. He was a member of the Peace Conference, and was premier in 1921–1922. The famous protocol providing for compulsory arbitration, adopted by the Assembly of the League of Nations in September 1924, was prepared by him. He is the author, also, of *Bohemian Case for Independence* (1917), *Detruisez l'Autriche-Hongrie* (1916), and *The Spirit of the Czechoslovak Revolution* (1923).

Beneven'to, province, Italy, in the south central part, with an area of 819 square miles. The surface is rugged, and the people are chiefly engaged in agriculture. Pop. (1921) 266,980.

Benevento, city and archiepiscopal see, Italy, capital of the province of Benevento, is situated on a hill between the rivers Sabato and Calore; 60 miles by rail northeast of Naples. The town still retains its ancient walls, and to the north is the Porta Aurea, a famous triumphal arch erected in A.D. 114, in honor of the Emperor Trajan. Other notable features are the Lombardo-Saracenic cathedral dating from the 11th century; the 8th-century church of St. Sophia; the 14th-century castle, and the town hall. There are manufactures of leather and silver-plate, and trade in grain. Pop. (1921) 27,510.

Beneventum, originally known as Maleventum ('ill wind'), was founded by Diomedes. In 275 B.C., Pyrrhus, king of Epirus, was defeated here by the Romans, and the name was changed to Beneventum ('fair wind'). In A.D. 545 it was destroyed by the Gothic king Totila. It was the chief city of an independent Lombard duchy from the 6th to the 11th century, and was a papal possession from 1053 to 1806, when Napoleon created it a principality. In 1815 it was restored to the Pope, and in 1860 became a part of the kingdom of Italy. The town has frequently suffered damage from earthquakes.

Benev'olence, forced loans demanded from the English people by Edward IV. and succeeding sovereigns. Though under the guise of a willing offering, these contributions were absolutely compulsory, and became one of the chief grievances of the nation. They were nominally abolished by Parliament in 1484, but persisted until the time of James I.

Benevolent Societies. See FRATERNAL SOCIETIES.

Benfey, ben'fī, THEODOR (1809–81), German orientalist, of Jewish extraction, a distinguished student of comparative philology and folklore, was born in Nörten, near Göttingen. He was appointed extra professor of Sanskrit and comparative philology at Göttingen in 1848, and professor in 1862. The chief result of his early studies was his *Griechiches Wurzellexikon* (1839–42). His works on Sanskrit include an edition of the *Sâma Veda* (1848), *Handbuch der Sanskritsprache* (1852–4), *Kurze Grammatik der Sanskritsprache* (1858), subsequently translated into English, an edition of the *Panchatantra* (2 vols., 1859), and a *Sanskrit-English Dictionary* (1866).

Bengal, ben-gôl', a province of British India, constituting, since 1912, the Presidency of Bengal. It stretches from the Himalayas to the sea, with an area of 76,843 square miles. Except for spurs of the Himalayas in the northern and eastern parts, the surface is a fertile, alluvial plain watered by the Ganges and the Brahmaputra. Indeed, the greater part of Bengal is a delta in various stages of formation, due to the changes which have from time to time taken place in the course of the Ganges. The southernmost portion of this delta, some 6,500 square miles, is known as the Sundarbans, a jungle of forest and swamp, which, however, is gradually being reclaimed and converted into productive rice fields. The climate is generally tropical, except in the Himalayan region where alpine cold and temperate conditions prevail. There are three well defined seasons, cold, hot, and rainy. Rainfall is abundant, and humidity excessive.

Bengal is rich in minerals, producing coal, copper, iron, manganese, gold, mica, slate, and saltpetre. Diamonds have been found in the bed of the Mahanadi River. Agriculture is the most important industry, three-fourths of the population being dependent upon it for a livelihood. Rice is the chief crop; others of value are maize, wheat, barley, jute, indigo, cinchona, tea, tobacco, and oilseeds. A large laboring class is employed in jute mills, tea gardens, iron and steel works, silk and cotton mills, and tobacco factories. Stone and ivory carving employ numbers of skilled workmen. Manfacturing is of constantly increasing importance.

The rivers are the chief means of communication, supplemented by canals. There are good roads in many parts of the province, and more than 2,000 miles of railway. The population, chiefly Mohammedan and Hindu, numbers 46,695,536 (1921).

The Bengal Presidency is administered by a Governor in Council, assisted by a legislative council of at least 125 members. Not under direct British rule are two Native States, Cooch Behar and Hill Tippera, with a combined area of 5,434 square miles and a population which numbered 896,936.

History—The earliest inhabitants of Bengal are said to have been Dravidians. In the 6th century B.C. arose the kingdom of Magadha (Bihar) under the Mauryas. This was overthrown in the first century B.C., and in the 4th century A.D. the country became part of a united empire under the Gupta dynasty. In the 12th century Mohammedan invaders conquered the land and for about 400 years Bengal was governed by Moslem rulers. It was under the dominion of Afghan chiefs from about 1540 until 1576, when it was annexed to the Mogul empire. Following Lord Clive's victory at Plassey in 1765 (see CLIVE, ROBERT), it passed to the control of the British East India Company, which had made its first settlement there in the 17th century. Since that time Bengal has been under British administration, and its history has been that of British India. Various changes in boundaries and administrative areas have been made at different times in order to meet changing conditions of population. The province was constituted a presidency, with its present boundaries, in 1912. Consult O'Malley's *Bengal, Behar and Orissa, Sikkim* (1917).

Bengal, BAY OF, an extension of the Indian Ocean, between India on the west, and Burma and the Malay Peninsula on the east, measuring more than 1,200 miles from north to south and about 1,300 miles from east to west. It receives the waters of the Salwin, Irawadi, Brahmaputra, Ganges, Mahanadi, Godavari, and Kistna. On the west there are no good harbors, but on the east are the ports of Akyab, Rangoon, Moulmein, and Tavoy. In the eastern part of the bay are the Andaman, Nicobar, and Mergui Islands; at its southwest corner is Ceylon.

Bengal Gram, the seed of an annual leguminous plant (*Cicer arietinum*), often called chick pea (q. v.).

Bengali Language and Literature, ben-gä'lĭ, The Bengali language, one of the chief dialects of India, spoken by more than forty million people, is derived from Sanskrit. The alphabet is simplified from the Devanagari alphabet, which in its turn was a development of the Indo-Pali character used by Asoka in the third century B.C.

Bengali literature, properly speaking, began in the fourteenth century with imitations of the song of Jayadeva, who flourished in the twelfth century. His great work *Gita Govinda* is a collection of beautiful songs concerning the love of Krishna and Radhika. Chandi Das is the earliest vernacular poet of Bengal. He lived in the fourteenth century and has immortalized the washerwoman Rami in his songs of love. In the fifteenth century the Sanskrit epics were translated into Bengali, and in the sixteenth came the religious reform inaugurated by Chaitanya, which gave a great impetus to theological and poetic literature. The sixteenth century also produced Raghunandan, who wrote an exhaustive treatise on rites and observances for the Bengal people, and the logician Raghunath. The seventeenth century is distinguished for the work of the poet Mukunda Ram. Ram Prasad Sen and Bharat Chandra Rai are the two great poets of the eighteenth century.

The nineteenth century witnessed a notable revolution in Bengali thought and ideas. Outstanding names of this period are Ram Mohan Rai, often called the father of prose literature in Bengal; Iswar Chandra Gupta, poet and satirist; Akhay Kumar Datta, whose prose is a model of dignity and earnestness; Iswar Chandra Vidyasagar, whose work in behalf of Hindu widows and other native women is of equal importance with his literary achievements; Ram Narayan Tarkaratna and Dina Bandhu Mitra, both dramatists; Madhu Sudan Datta, the author of *Tilottama*, a noble epic poem, and the drama *Sarmishtha;* and Bankim Chandra Chatterjea, whose social and historical tales won remarkable popularity. The most important writer of the twentieth century is Sir Rabindranath Tagore (q. v.), who was awarded the Nobel prize in literature in 1913. Other notable contemporary writers are Ghose, Banerjea, Kali Lahiri, Mukerji and Dinesh Chandra Sen.

Bengali grammars and dictionaries have been published by Nicholl, Beames, Ghosal and Shahidullah. Consult Sen's *History of Bengali Language and Literature* (1911); De's *History of Bengali Literature in the Nineteenth Century* (1919); Anderson's *Manual of the Bengali Language* (1920); Mazumdar's *History of the Bengali Language* (1920).

Bengal Lights, colored fires—red, white, green, blue, or yellow—used as signals and in pyrotechny. Potassium chlorate, antimony sulphide, and sulphur are the chief ingredients.

Bengazi, ben-gä'zē, or BENGHAZI (anc. *Berenice*), seaport town, North Africa, capital of the district of Cyrenaica, Italian Libia. It is the terminus of a caravan route from Wadai and has a good harbor, but silt-filled. The chief exports are barley, ivory, ostrich feathers, and sponges. Pop. 30,000.

Beng'el, JOHANN ALBRECHT (1687–1752), German biblical critic, was born in Winnenden, in Würtemberg. He studied at Tübingen, acted as repetent or (theological) lecturer there for five years, and in 1713 became head of the preparatory theological institute at Denkendorf, where he remained for twenty-eight years. In 1741 he was made prelate of Herbrechtingen, and eight years later prelate at Alpirspach. Bengel's chief work was upon the New Testament, his *Apparatus criticus* (1734) being the starting point for modern text-criticism. Other works are *Gnomon Novi Testamenti* (1742), which is still in use as a suggestive commentary, and has had considerable influence on exegesis in Germany and England; *Erklarte Offenbarung Johannis* (1740); *Ordo Temporum* (1741).

Benguella, beng-gä'lä, town, Angola, Portuguese West Africa, capital of the district of Benguella, is situated on the Atlantic coast, about 300 miles south of Loanda. The chief exports are rubber, wax, cattle, hides, and sugar. The town was formerly an important slave-trading centre. Pop. 4,000.

Benguet, ben-gat', province, Luzon, Philippine Islands, in the north central part, with an area of 900 square miles. The surface is mountainous, covered with beautiful forests; there are deposits of copper, gold, iron, coal, and limestone; and wheat, rice, coffee, tea, beans, and potatoes are grown. Baguio, the capital, 175 miles north of Manila, is a favorite resort. Pop. (1918) 43,768.

Benhadad, ben-hā'dad, the name given in the Old Testament to three (or two) kings of Damascus—*i.e.* Syria. Benhadad I. allied himself with Asa of Judah against Baasha of Israel (1 Kings xv. 18–22). His son, Benhadad II., the Dad-idri (*i.e.* Hadadezer) of the inscriptions, was defeated by Shalmaneser II. of Assyria at Karkar in 853 B.C. He warred against Ahab and besieged Jerusalem and Samaria (1 Kings xx.; 2 Kings vi.–vii.). He was slain by Hazael (2 Kings viii. 7–15). Benhadad III. (Mari), son of Hazael, was thrice vanquished by Joash, king of Israel (2 Kings xiii. 25). Some—*e.g.* Cheyne—identify Benhadad I. and II.

Benham, ben'*a*m, ANDREW ELLICOTT KENNEDY (1832–1905), American naval officer, was born in New York. He was appointed a midshipman in 1847, and was commissioned lieutenant in 1855. In the Civil War he saw service with the blockading squadrons in the South, and took part in various engagements. In 1894 he obliged the insurgent squadron at Rio de Janeiro, Brazil, to raise their blockade and cease firing upon American merchant craft. He was made rear admiral, 1890, retiring in 1894.

Benham, ben′*a*m, WILLIAM (1831–1910), English theological writer, was born in Hampshire and was educated in King's College. He was tutor in St. Mark's College, Chelsea (1857–64); professor of modern history, King's College, London (1864–73); honorary canon of Canterbury (1885); and Boyle lecturer in 1897. He was rector of St. Edmond's from 1882 and rural dean of East City from 1903 until his death. His works include *A New Translation of Thomas à Kempis' 'Imitatio Christi'* (1874); *Cowper's Letters* (1883); *A Short History of the Episcopal Church in America* (1884); *The Dictionary of Religion* (1887); *Life of Archbishop Tait* (in collaboration with the Bishop of Winchester, 1891). He was the editor of the *Ancient and Modern Library of Theological Literature.*

Beni, bā-nē′, or PARO, river, Bolivia. See AMAZON.

Beni, a department of Bolivia, in the northeastern part, bordering upon Brazil; area 101,814 square miles, heavily forested but with some prairie land. The collection of rubber is the chief industry. Trinidad is the capital. Pop. about 35,800.

Benicia, be-nish′i-*a*, seaport city, California, Solano County, on the Strait of Carquinez, and on the Southern Pacific Railroad; 24 miles northeast of San Francisco, to which it has boat service. It has a good harbor, a U. S. arsenal and barracks, shipyards, packing houses, and manufactures of iron implements, leather goods, wagons, and dairy products. Pop. (1910) 2,360; (1920) 2,693.

Beni-Hassan, bā′nē-häs′sän, village, Egypt, on the right bank of the Nile; 15 miles southeast of Minieh. In its neighborhood, and overlooking the river, are catacombs believed to have been the tombs of the people of the ancient Hermopolis. Pop. 1,300.

Benin, ben-ēn′, province, town, and river in the Southern Province of the British Protectorate of Nigeria. The province has a fertile soil which produces rice, yams, cotton, sugar, tobacco and fruits. Palm-oil is the chief export. It was discovered by the Portuguese in 1486, and was the centre of the slave trade until its suppression by the British. The inhabitants, formerly savage barbarians, have become law abiding and industrious. The city of Benin is 75 miles inland and has a population of about 15,000.

Benin, BIGHT OF, a division of the Gulf of Guinea, extending along the southern coast of Nigeria, from Cape Formosa on the east to Cape St. Paul on the west.

Beni-Saf, bā′nē-säf′, seaport, Algiers, in the department of Oran; 30 miles north of Tlemsen. It has a good harbor but owes its importance entirely to its rich iron mines. Pop. about 4,500.

Beni-Suaf, bā′nē-swef′, town, Upper Egypt, capital of the province of the same name (pop. 452,893), on the right bank of the Nile; 77 miles southwest of Cairo. It is a trade centre for the Fayum district, and has sugar and cotton manufactures. Pop. (1917) 31,986.

Benjamin ('son of the right hand' or 'of the south'), the youngest son of the patriarch Jacob, and the only full brother of Joseph. He was born near Ephrath—Rachel, his mother, dying at his birth (Gen. xxxv. 18). She named him Ben-Oni, 'son of my pain,' but his father changed it to Benjamin, a word portending comfort or consolation.

Recent Old Testament scholarship regards Benjamin not so much as a historical character as the 'eponymous' ancestor of the tribe of that name. Its territory lay immediately to the north of Judah, and consisted of a rugged region, better fitted to produce warriors than farmers (see Gen. xlix. 27). The tribe did serviceable work in repelling the Philistines, and gave Israel its first king, Saul. At the rending of the kingdom it remained faithful to the Davidic dynasty, and after the exile joined Judah in the claim of being the only true inheritors of the promises. The prophet Jeremiah and the apostle Paul were of the tribe of Benjamin.

Benjamin, JUDAH PHILIP (1811–84), American Confederate leader, was born of English-Jewish parentage on the island of St. Croix, W. I. He was educated at Yale (1825–8), and settled in New Orleans. He was a member of the Louisiana Constitutional Convention of 1845, and in 1853 became a Whig member of the U. S. Senate, in which he was prominent as a debater on the Southern side, in all matter concerning the question of slavery restrictions. He resigned in February, 1861, and during the Civil War was the ablest and most influential member of President Davis' cabinet, becoming known as 'the brains of the Confederacy.' He was in turn Attorney-General (February-August 1861), Secretary of War (November 1861–February 1862), and Secretary of State (1862–5). Upon Lee's surrender he escaped to England, where he soon became one of the most successful lawyers in Great Britain, and in 1872 was made a Queens Counsel. His work, generally known as *Benjamin on Sales* (1868), is a classic.

Benjamin, MARCUS (1857–), American scientist and editor, was born in San Francisco, Cal. He was graduated from the School of Mines, Columbia University, in 1878, and in 1882 became editor of *The American Pharmacist.* He engaged in cyclopædia and dictionary work in New York, at the same time acting as sanitary engineer for the New York Board of Health. He is a member and officer in many learned societies, and has contributed largely to scientific and other periodicals. In 1896 he became editor at the U. S. National Museum, Washington, D. C.

Benjamin OF TUDELA (d. 1173), a learned Israelite and rabbi, was born in Tudela, Spain. He visited Constantinople, Egypt, Assyria, Persia, and Chinese Tartary (1159–73). An account of his travels, based upon his notes, was first published in Constantinople in 1543, under the title *Mazahoth* ('Excursions').

Benjamin, PARK (1809–64), American journalist, was born in Demerara, British Guiana, and was graduated (1829) from Trinity College, Hartford. He edited the *New England Magazine,* 1835–7, which he transferred to New York as the *American Monthly Magazine* in 1837; assisted Horace Greeley on the *New Yorker;* established the *New World* in 1840; and was associated with other journalistic ventures.

Benjamin, SAMUEL GREENE WHEELER (1837–1914), American author and diplomat, son of a missionary, was born in Argos, Greece. He was educated at the English College in Smyrna and at Williams College, from which he was graduated in 1859. He was for some years assistant Librarian at the Albany State Library, studied art, and travelled widely in Europe and the East. He was U. S. minister to Persia (1883–5). Among his many published books are *Constantinople, Isle of Pearls, and Other Poems* (1861); *The Choice of Paris, a Romance of the Troad* (1870); *What is Art?* (1877); *Persia and the Persians* (1886); *The Story of Persia* (1887).

Benjamin-Constant. See CONSTANT.

Benjamin Tree, the tree from which benzoin is obtained. See BENZOIN.

Benkulen. See BENCOOLEN.

Ben Lomond, mountain (3,192 feet), in Stirlingshire, Scotland, on the east side of Loch Lomond.

Ben Macdhui, mak-do͞o′i, mountain (4,296 feet) in Aberdeenshire, Scotland, at the junction of the shires of Banff, Aberdeen, and Inverness.

Ben More, mōr, mountain (3,843 feet), Southwest Perthshire, Scotland, 9 miles from the head of Loch Lomond.

Benmore Head. See FAIR HEAD.

Benne Oil, ben'i, an oil obtained from the seeds of *Sesamum indicum*, an Indian plant belonging to a tropical order related to Scrophulariaceæ. It is called also gingili or gingelly, sesamum, til, and teel oil. Its uses are similar to those of olive oil.

Bennet, Henry. See ARLINGTON, EARL OF.

Bennett, (ENOCH) ARNOLD (1867–), English novelist, was born in Hanley, in North Staffordshire, and was educated at Newcastle-under-Lyme. He entered a lawyer's office in London, but after a few years he abandoned law for editorial work on a woman's paper, of which he became editor. In 1900 he resigned this position and devoted himself to writing. His best works are his series of novels portraying life in the Five Towns, *Anna of the Five Towns* (1902), *The Old Wives Tale* (1906), *Clayhanger* (1910), *Hilda Lessways* (1911), and *The Matador of the Five Towns* (1912). Among his many other works are the novels *A Man from the North* (1898), *A Great Man* (1904), *The Old Adam* (1913), *These Twain* (1916), *The Card* (1916), *The Roll Call* (1918), *The Pretty Lady* (1918), and *Mr. Prohack* (1922); the plays *Polite Farces* (1899), *What the Public Wants* (1910), *The Great Adventure* (1913), *Body and Soul* (1921); also *Your United States* (1913), *Over There* (1915), *Books and Persons* (1917), *How to Make the Best of Life* (1923), *Riceyman Steps* (1923), *Elsie and the Child* (1925), *Lord Raingo* (1926), *The Vanguard* (1927).

Bennett, JAMES GORDON (1795–1872), American journalist, was born in Newmills, Banffshire, Scotland, and emigrated to America in 1819. He settled at Halifax, but being unsuccessful as a teacher of bookkeeping there, removed to Boston and New York (1822), where he began to write for the press. He was variously occupied in Washington and other Eastern cities as reporter, correspondent and editor for different papers, and as a newspaper man was more or less concerned with politics. Becoming dissatisfied, however, he originated the idea of the *New York Herald* as an independent newspaper, and published the first number May 6, 1835. Bennett introduced many novel features of gathering news, and through his original methods gained for his paper a large circulation.

Bennett, JAMES GORDON (1841–1918), American journalist and proprietor of the New York *Herald*, was born in New York and was educated abroad, under private tutors. He succeeded to the ownership of the *Herald* on the death of his father in 1871, and directed its policies and conduct by cable from Paris. He issued a Paris edition, which was continued after his death, and for a time he published also a London edition. In conjunction with the London *Daily Telegraph*, he fitted out Stanley's expedition to Africa (1874–8); he also equipped the *Jeanette* Polar Expedition (1879) and with John W. Mackay established the Mackay-Bennett Commercial Cable Co. (1883). He introduced the publication in England of storm warnings sent from the United States. At one time Mr. Bennett took an active interest in yachting, and sailed two races across the Atlantic. Later he became interested in automobiling and aeronautics.

Bennett, JOHN HUGHES (1812–75), English physician and physiologist, was born in London. He studied at the University of Edinburgh, and in 1848 was elected to the chair of the institutes of medicine there. He was distinguished for his studies in histology and therapeutics.

Bennett, RICHARD BEDFORD (1870–), Canadian statesman, was born in Hopewell, New Brunswick, and educated at Dalhousie University, Halifax, N. S. He commenced the practice of law in New Brunswick, but in 1897 moved to Calgary, Alberta, where from 1898 to 1905 he was a member of the Legislature of the Northwest Territories. Later on he was a member of the Alberta Provincial Legislature from 1909 to 1911, when he resigned and was elected to the Dominion House of Commons as a Conservative. In 1917, during the war period, he was appointed Director-General of National Service. In 1921 he became Minister of Justice in the administration of Mr. Arthur Meighen, but resigned shortly afterwards. When the first King Ministry resigned in 1926, Mr. Bennett became Minister of Finance in the short-lived second Meighen administration. In November 1927 he was chosen as Meighen's successor. He is the first leader of either of the great historic parties to come from so far west as Alberta, and his choice may be considered to symbolize the growth of the political importance of Western Canada in the Confederation.

Bennett, SIR WILLIAM STERNDALE (1816–75), British composer and pianist, was born in Sheffield. He studied at the Royal Academy of Music, London, and at Leipzig, and for some years (from 1856) was professor of music at Cambridge. He became principal of the Royal Academy in 1868, and was knighted in 1871. Among his more noteworthy works are the overtures *Tempest* (1832), *Merry Wives of Windsor* (1833), and *Paradise and the Peri* (1867); *The May Queen* (1858), a cantata; *The Woman of Samaria* (1867), an oratorio; *Genevieve* (1873), a romance; *The Maid of Orleans* (1873), a sonata; the anthems, *Cast thy Bread upon the Waters* (1874), *Remember now thy Creator* (1879).

Bennett, Lake, in Northwestern Canada, near Chilkoot Pass.

Bennettsville, town, South Carolina, county seat of Marlboro County, on the Atlantic Coast Line, and the Bennettsville and Cheraw, and the Rockingham Railroads; 130 miles north of Charleston. The town has a Sanitarium and Public Library. It is the centre of a cotton and agricultural district and has manufactures of cotton goods. Pop. (1910) 2,646; (1920) 3,197.

Ben Nevis, nē'vis, mountain (4,406 ft.), the loftiest mountain in Great Britain, in Inverness-shire, Scotland, overlooking Glen Nevis, toward Fort William.

Bennigsen, ben'ig-sen, LEVIN AUGUST THEOPHIL, COUNT (1745–1826), Russian general, a native of Brunswick who entered the Russian army in 1773. He was made a major general, and commanded at Eylau (1807), led the Russian centre at Borodino (1812), defeated Murat at Tarutino (1812), and (1813) shared in the famous victory of Leipzig.

Bennington, village, Vermont, county seat of Bennington County, in the southwest corner of the State, on the Chatham and the Bennington branches of the Rutland Railroad. It is the seat of the State Soldiers' Home. On Old Bennington Hill, on the site of the Catamount Tavern of revolutionary days, stands the famous Cat in Bronze. A monument 300 feet in height commemorates General Stark's victory on Aug. 16, 1777. Woollen goods, cashmere, hosiery, shirts, and collars are manufactured. Pop. (1910) 6,211; (1920) 7,230.

Bennington, BATTLE OF, a battle of the American Revolution fought at Bennington, Vt., Aug. 16, 1777, between a force of about 1,300 German and British soldiers under Colonel Baum and about 2,000 Americans under General Stark. The British forces were defeated.

Ben-nut Tree (*Moringa pterygosperma*), a tree belonging to a small order of plants found in Arabia and East Indies. Its bark yields gum; and its seeds are the source of ben oil.

Benoit, be-nwä', DE SAINTE-MORE, or MAURE, French troubadour of the 12th century; at the request of Henry II. of England composed his great poem of 45,000 octosyllabic verses, *Chronique des ducs de Normandie* (about 1180). It was edited by Francisque Michel, in three volumes, in 1836–44. His *Roman de Troie*, running to over 30,000 verses, enjoyed great popularity in the Middle Ages. It was edited by M. A. Joly, in two volumes, in 1870–71. To him are also attributed *Eneas*, a poem of 10,000 verses, and *Le Roman de Thebes*, a poem of 15,000 verses.

Benoit, Peter Léonard Léopold (1834–1901), Belgian musical composer and critic, was born in Harlebeke, Belgium. His ambition was to form a distinctively Flemish movement in music, based upon the theories of Wagner and Liszt, but in this he had slight success. He was director of the conservatory of Antwerp (1867) and author of several operas (*e.g. Isa*, 1867), oratorios (*e.g. Lucifer*, 1866; *Oorlog*, 1873), cantatas, and ecclesiastical pieces.

Bensberg, bens'ber*ch*, village, Prussia, 11 miles by rail east of Cologne. A chateau built by the Elector Palatine John William, in 1705, is now used as a military school. Lead, zinc, and iron are mined in the vicinity. Pop. (1919) 12,080.

Ben'son, Arthur Christopher (1862–1925), English author, was the second son of Archbishop Benson (see Benson, E. W.). He was educated at Eton, and at King's College, Cambridge; was a master at Eton (1885–1903), and a fellow (1904–15) and master (1915–25) of Magdalene College, Cambridge. His publications include: *Memoirs of Arthur Hamilton*, published under the pseudonym 'Christopher Can' (1886); *Archbishop Laud* (1887); *Men of Might* (with H. F. Tatham, 1890); *Poems* (1893); *Lyrics* (1895); *Essays* (1896); *Lord Vyet, and other Poems* (1897); *Fasti Etonenses* (1899); *Life of Archbishop Benson* (1899); *The Professor, and other Poems* (1900); *The Schoolmaster* (1902); *Tennyson* (1902); *Coronation Ode* (1902); *The Hill of Trouble* (1903); *The House of Quiet* (anonymously, 1904; new ed., 1906); *Peace, and other Poems* (1905); *From a College Window* and *The Upton Letters* (1906); *Beside Still Waters* (1907); *At Large* (1908); *Ruskin: a Study in Personality* (1911); *Hugh: Memoirs of a Brother* (1915); *Life and Letters of Maggie Benson* (1917); *The Reed of Pan* (1923).

Benson, Edward Frederic (1867–), English novelist, third son of Archbishop Benson, was born in Wellington College. He was educated at Cambridge, and was connected with the British Archæological School in Athens (1892–5), and with the Hellenic Society in Egypt (1895). His works include *Dodo* (1893); *Rubicon* (1894); *The Babe, B. A.* (1897); *Mammon and Co.* (1900); *Book of Months* (1903); *The Angel of Pain* (1906); *The House of Defence* (1907); *The Osbornes* (1910); *Dodo the Second* (1914); *Dinner for Eight* (comedy, 1915); *Crescent and Iron Cross* (1918); *Our Family Affairs* (1920); *Dodo Wonders* (1921); *Colin* (1923); *Mother* (1925); *Colin II.* (1926).

Benson, Edward White (1829–96), Archbishop of Canterbury, was born near Birmingham, England. He was a master at Rugby, became a priest in 1856, and served as the first headmaster of Wellington College, from 1858 to 1872. In 1872 he became chancellor of Lincoln, where he instituted a theological college. He was made bishop of Truro in 1877, and founded the cathedral there, which was consecrated in 1887. He was appointed Archbishop of Canterbury in 1882. His *Life of Cyprian* (1897) and *The Apocalypse* (1900) were published posthumously.

Benson, Frank Weston (1862–), American painter, was born in Salem, Mass. He studied drawing and painting in the Museum of Fine Arts, Boston (1880–3), and in the Julien Academy, Paris (1883–5), and in 1889 became instructor of painting and drawing in the Museum of Fine Arts, Boston. He is a member of the National Institute of Arts and Letters, and one of the 'Ten American Painters.' He is known chiefly as a painter of women and children, and of out-of-door studies. His works include decorations in the Congressional Library, Washington, representing the *Seasons* and the *Three Graces* (1896); *My Little Girl* (1897); *In a Spruce Woods* (1905); *Eleanor* (1908); and *Portrait of Professor Clark* (1908).

Benson, Robert Hugh (1871–1914), English author, son of Archbishop Benson, was born in Wellington College, was educated at Eton and at Trinity College, Cambridge, and took orders in the Anglican church. He was received into the Roman Catholic Church in 1903, and the following year was ordained a priest. In 1911 he was appointed private chamberlain to Pope Pius x. His works include: *The Light Invisible; The Queen's Tragedy; The Dawn of All* (1911); *The Friendship of Christ* (1912); *Come Rack! Come Rope!* (1912); *An Average Man* (1913); *Initiation* (1914).

Bent, James Theodore (1852–97), English author and traveller, was born near Leeds. He was graduated from Wadham College, Oxford (1875), and subsequently travelled widely. In 1891 he visited South Africa, and explored the ruins of Zimbabwe, discovered by the German traveller Mauch in 1871, which he pronounced to be of Arab origin. In 1893–4, with his wife, daughter of R. W. Hall-Dare, he went to South Arabia, which he again visited in 1896–7. On this latter journey he contracted malarial fever, of which he died shortly after his return to London. The results of Bent's explorations appear in *The Ruined Cities of Mashonaland* (1892; 3rd ed. 1895), *The Sacred City of the Ethiopians* (1893; 2nd ed. 1896), and *Southern Arabia*, this last being published by his wife after his death (1900).

Bent, Silas (1820–89), American naval officer, particularly distinguished as a meteorologist and hydrographer, was born in St. Louis, Mo. He became a midshipman in the U. S. Navy in 1836, and a lieutenant in 1849. He served as a captain in Perry's famous expedition to Japan (1853–4), and is remembered chiefly as the first scientific writer to describe fully (1855) the Japanese Current or Kuro Shiwo. He is known, also, for his researches into the meteorology and climatology of parts of the Great Basin in the Western United States.

Bent Grass, a genus of grasses (*Agrostis*) including nearly a hundred species widely distributed over the globe. All flower in a loose, spreading panicle, and the small spikelets bear but one flower apiece. The more important varieties are the Common Bent Grass or Red Top, a variety of *A. alba* extensively cultivated as a fodder plant in Europe and America; the Marsh Bent Grass (*A. alba*), also useful for pasturage; Cloud Grass (*A. nebulosa*), a Spanish variety of beautiful light feathery habit; Creeping Bent Grass (*A. stolonifera*), which gives a velvety turf for lawns; Rhode Island or Brown Bent Grass (*A. canina*), a perennial grass which makes a dense sod.

Ben'tham, George (1800–84), English botanist, nephew of Jeremy Bentham (q. v.), was born near Plymouth. He studied for the law, and in 1827 produced *Outlines of a New System of Logic*, containing the first clear statement of the doctrine of the quantification of the predicate—a discovery commonly attributed to Sir W. Hamilton. From 1832 he devoted himself exclusively to his favorite study of botany. His best-known work is his *Handbook to the British Flora* (1858); but his greatest achievement is his share, the major portion, of the epoch-making *Genera Planta-*

rum (3 vols., 1862–83) written with Sir Joseph Hooker. Bentham's *Labiatarum Genera et Species* (1833–6) and *Flora Australiensis* (5 vols., 1863–70), the last in conjunction with Ferdinand von Müller, were also important works. He was president of the Linnæan Society from 1861 to 1874.

Bentham, JEREMY (1748–1832), one of the most productive and influential of English writers on politics and jurisprudence, was the son of a prosperous London attorney. He was granted his bachelor's degree from Queen's College, Oxford, in 1763, and in the same year entered Lincoln's Inn. His first important work, *A Fragment on Government* (1776), was a daring attack on the accepted theories expressed by Blackstone in the first volume of his *Commentaries*, and met with immediate success. Like all Bentham's works, it is distinguished by a reckless contempt for time-honored formulæ. It has, however, a terseness and simplicity of expression not often found in his later writings. A more comprehensive work, *Introduction to the Principles of Morals and Legislation*, appeared in 1789, setting forth the principles by which, in the author's view, the whole conduct of private citizens and rulers alike should be guided. These principles may be summed up in the single word 'utilitarianism,' or the doctrine of 'the greatest happiness of the greatest number.'

In 1785 Bentham had visited Russia, to see his brother, Samuel Bentham, then engaged in the service of the Tsar, and from that country he brought back his famous idea of a *Panopticon*, or model prison, which occupied him for many years, and on which he wrote in 1791. In 1792 he came into an easy fortune by the death of his father.

On the outbreak of the French revolution Bentham threw himself with enthusiasm into the voluntary work of advising the leaders of the revolutionists, and when he visited Paris in 1823, he was received with the utmost honor. The reform of the poor law, the amplification of judicial procedure, the recasting of the law of evidence, were some of the more important subjects which occupied his long years of untiring industry at Ford Abbey, in Wiltshire, to which he retired in 1814, and where he spent the remainder of his life.

Consult Stephen's *English Utilitarians;* Atkinson's *Jeremy Bentham: His Life and Work.*

Bentinck, ben'tingk, LORD WILLIAM CAVENDISH (1774–1839), governor-general of India, son of the third Duke of Portland. He acted as governor of Madras (1803–07), saw service in the Peninsula under Moore, and commanded the British forces in Sicily (1811–14). He was governor of Bengal in 1827, and from 1828 to 1835 was governor-general of India. His administration was marked by financial and legal reforms, the abolition of suttee or widow-burning, the suppression of the Thugs, and measures directed towards educating the natives and opening to them a larger share in the government of India.

Bentinck, LORD WILLIAM GEORGE FREDERICK CAVENDISH (1802–48), son of the fourth Duke of Portland, commonly known as Lord George Bentinck. Though elected M.P. for King's Lynn in 1826, he devoted himself largely to the turf, where he did much to raise the tone of racing circles. He promoted the enfranchisement of the Irish and Jews, and in 1845 headed the Protectionist party in their opposition to and defeat of Sir Robert Peel.

Bent'ley, RICHARD (1662–1742), English scholar and divine, was born in Oulton, Yorkshire, the son of a yeoman. He was educated at Cambridge, became headmaster of Spalding grammar school, in 1682, and afterward delivered, at Oxford, the Boyle lectures on the Evidences of Natural and Revealed Religion. In 1691 he published his exhaustive *Letter to Mill* on the Greek chronicler John Malelas, which showed him to be a master of textual criticism. In 1697 he appended to a second edition of Wotton's *Reflections on Ancient and Modern Learning* a few notes demonstrating the spuriousness of the reputed *Epistles of Phalaris*. Atterbury and Smallridge replied, whereupon Bentley published his *Dissertation on the Epistles of Phalaris*, proving that the epistles were forgeries of about the fourteenth century. In 1700 he was appointed master of Trinity College, Cambridge, and in 1717 regius professor of divinity. Bentley's life at Cambridge was one of unceasing warfare with the authorities; but although he was nominally deprived of his university degrees in 1718, and deposed from his mastership in 1734, he actually retained possession of both until his death.

In 1711 Bentley edited *Horace*, in 1726 *Terence*, and in 1732 *Paradise Lost*. In 1720 he propounded a scheme for printing an edition of the Greek New Testament, in which the text should be corrected by a careful comparison with the Vulgate and all the oldest existing Greek MSS., but these principles of criticism met with opposition from his contemporaries, though they have since been generally adopted by Biblical scholars. After Bentley's death appeared his *Discursus on Latin Metres*, *Remarks upon a late Discourse of Free Thinking* (1743), and *Eight Sermons preached at the Hon. R. Boyle's Lectures* (1724). Consult Monk's *Life; Correspondence*, edited by C. Wordsworth, bishop of Lincoln; Dyce's unfinished edition of Bentley's works (3 vols.); R. C. Jebb's *Bentley*, in the 'English Men of Letters' series.

Bentleyville, borough, Pennsylvania, in Washington county, on the Pennsylvania Railroad; 40 miles south of Pittsburgh. Pop. (1910) 1,922; (1920) 3,679.

Ben'ton, town, Arkansas, county seat of Saline county, on the Chicago, Rock Island and Pacific, and the Missouri Pacific Railroads; 25 miles southwest of Little Rock. Pop. (1910) 1,708; (1920) 2,933.

Benton, city, Illinois, county seat of Franklin county, on the Chicago and Eastern Illinois, the Illinois Central, and the Missouri Pacific Railroads; 70 miles northeast of Cairo. It has extensive coal mining interests and manufactures stoves and display signs. Pop. (1910) 2,675; (1920) 7,201.

Benton, JAMES GILCHRIST (1820–81), American soldier, was born in Lebanon, N. H. He was graduated (1842) from West Point, was assigned to the ordnance service, and in 1847 assisted, at Washington, in preparing the *Ordnance Manual*. He commanded the Charleston, S. C., arsenal, 1853, and was occupied at Washington, 1853–7, with experiments which resulted in the adoption of the Springfield rifle in place of the old musket. Benton was at Washington during the Civil War, filling high offices in the ordnance department, and was in command of the national armory at Springfield, Mass., from 1866 until his death. He invented many appliances for artillery, including a device for determining the velocity of a projectile by the use of electricity. He published *A Course of Instruction in Gunnery and Artillery* (1861, new ed. 1873).

Benton, THOMAS HART (1782–1858), American statesman, was born near Hillsborough, N. C. He studied for a short time in the University of North Carolina, and about 1799 removed to Tennessee. There he began the practice of law and served a term (1809) in the state senate. In 1812 he commanded a regiment in the Natchez expedition under Jackson, with whom he was to be closely associated in future years. In 1813 the friendship between the two was interrupted by misunderstanding over a duel in which Benton's brother was involved.

About 1815 Benton removed to St. Louis, where he practised law and was for a time editor of the semi-weekly *St. Louis Enquirer*, in which he untiringly advocated the admission of Missouri to the Union as a slave State. Upon the admission of Missouri as a State, Benton was chosen U. S. Senator (Democratic), serving until 1851.

Having become reconciled to Jackson, he assumed the leadership of the Jacksonian forces in the Senate. He energetically and ably carried on the fight against the second U. S. Bank, and, after a dramatic contest, secured the expunging from the Senate's records of the vote of censure passed on Jackson for his removal from the Bank of the government deposits. He was also the principal supporter in the Senate of President Van Buren.

Benton was a consistent expansionist, in this as in other things representing what was then the newer West. He opposed the tariff of 1828 and the compromise tariff of 1833—indeed he was never a protectionist as that term is now understood; he fought any inflation of the currency, thus earning the sobriquet 'Old Bullion'; contended for the rights of the United States in Oregon; and opposed the Mexican War, though after it had begun, he advocated its efficient prosecution. Though himself a slaveholder and heartily opposed to Abolitionist propaganda, he came more and more to see the evils of slavery and to disapprove of its extension. He insisted that the South had rights which should not be disregarded, but he was a stanch Unionist. He vigorously opposed the compromise measures of 1850, and this brought him, for the first time, into thorough disfavor in his State and cost him his seat in the Senate. Subsequently he served one term (1853–5) in the House of Representatives, bitterly opposing the Kansas-Nebraska Bill. In 1856 he was an unsuccessful candidate for the governorship of Missouri. It was chiefly after his retirement that he prepared, with prodigious industry, his *Thirty Years' View; or a History of the Working of the American Government 1820–50* (1854–6), and in his *Abridgement of the Debates of Congress 1789–1856* (16 vols. 1857–61), both works of great value. Benton died at Washington, D. C., April 10, 1858. Consult *Lives* by Roosevelt, Meigs, and Rogers.

Benton Harbor, city, Michigan, Berrien county, on the Cleveland, Cincinnati, Chicago and St. Louis, the Michigan Central, and the Pere Marquette Railroads; 1½ miles from Lake Michigan and 3 miles northeast of St. Joseph. It has manufactures of furniture, lumber, flour, machinery, and beet-sugar, and is an important grain and fruit centre, having the largest fruit market in the State. It is also a health resort, known especially for its mineral waters, which are exported. Pop. (1910) 9,185; (1920) 12,233.

Bentonville, town, Arkansas, county seat of Benton county, on the St. Louis-San Francisco Railroad; 160 miles northwest of Little Rock. It is the centre of an important apple-growing district and it has medicinal springs. Industrial establishments include a cannery, bottling works, fruit evaporators, barrel and brick works, rolling mills, and cider and vinegar factories. Pop. (1910) 1,956; (1920) 2,313.

Bentonville, village, North Carolina, in Johnston county; 17 miles west of Goldsboro. A battle was fought here March 19, 1865, between a Confederate force under Gen. J. E. Johnston and the left wing of Sherman's army, which resulted in a Federal victory.

Benue, ben'wē, or Binue, river, West Africa, rises in Adamawa, flows west with a northerly curve, and enters the Niger nearly opposite Lokoja. It is about 900 miles long, and is navigable for about 600 miles (above Yola) for boats of 5 feet draught.

Benvenuto, ben-vā-no͞o'tō, properly Tisio da Garofalo (1481–1559), Italian painter, last of the Ferrara school, called 'the miniature Raphael.' He adopted the Roman manner, sometimes producing great splendor of coloring. A gillyflower (*garofalo*) was often his signature. His chief works are at Ferrara, and in the London, Edinburgh, Dresden, Milan, Munich, and Berlin National Galleries. During the last years of his life he was blind.

Ben'wood, city, West Virginia, Marshall county, on the Ohio River, and on the Baltimore and Ohio, the Benwood and Wheeling Connecting, and the Pennsylvania Railroads; 5 miles south of Wheeling. The surrounding district is rich in iron. Pop. (1910) 4,976; (1920) 4,773.

Benzac'onine, an alkaloid formed by the partial hydrolysis of aconitine.

Benzaldehyde. See Almonds, Oil of.

Benzene, or Benzol (C_6H_6), a light (sp. gr. .88), colorless, mobile liquid with a peculiar odor. It freezes at 6° c., and is insoluble in water, but dissolves in alcohol, paraffins, and the like, and is itself a good solvent of fatty, resinous, and other substances that do not dissolve in water. It is very volatile, and burns in air with a smoky, luminous flame. Chemically it is a hydrocarbon in which six carbon atoms are symmetrically arranged in a ring, one hydrogen atom being attached to each carbon atom.

Benzene is obtained from coal tar (q. v.), being separated in the first place by fractional distillation, which, however, does not yield an entirely pure product. The benzene so obtained is designated as 90 per cent., 50 per cent., etc., the percentage figure representing the proportion that distils under 100° c. As pure benzene boils at 80° c., 90 per cent. benzene contains about 70 per cent. benzene.

Benzene is the parent substance of the aromatic series of organic compounds, yielding innumerable derivatives by the substitution of alkyl and other groups for the hydrogen atoms. Of these, nitro-benzene (obtained by the action of nitric acid on benzene) and aniline (obtained by the reduction of nitro-benzene) are among the more important. Benzene is used commercially as a solvent, and for the preparation of its derivatives, which are largely employed in the color industry (see Coal-Tar Dyes).

Benzidine, ben'zi-dēn ($NH_2.C_6H_4.C_6H_4.NH_2$), a derivative of benzene, used in the coal-tar color industry. See Coal-Tar Dyes.

Benzine, ben'zēn, or Benzoline, a mixture of the lower boiling paraffin hydrocarbons, known also as petroleum spirit or petroleum naphtha, obtained by the distillation of crude petroleum. It is not to be confused with benzene or benzol. Like benzene, it dissolves oils, waxes, and resins, and is a light, colorless liquid, with an ethereal odor and low boiling point, 45–75° c. It is used as a cleaning fluid, as an ingredient of varnishes, for enriching coal gas, and for other purposes.

Benzoate of Soda, a sodium compound, $C_6H_5.CO_2Na$, sometimes used as a food preservative (see Pure Food and Drug Law). It is employed medicinally in gout and rheumatism.

Benzo'ic Acid (C_6H_5COOH), an aromatic acid, occurring in gum benzoin, storax, and Peru and Tolu balsams. It may be obtained from benzoin by sublimation, but is almost exclusively prepared frum the toluene of coal tar by chlorination, followed by heating with milk of lime. Benzoic acid is a volatile crystalline solid, soluble in 280 parts of cold and 15 parts of boiling water, and 2 parts of alcohol. Its vapors have a peculiar odor, which produces an irritating effect on the lungs. Benzoic acid forms a series of salts, the benzoates, which, like the acid, are employed in medicine. It acts as an antiseptic and expectorant, though the acid itself and its salts are antipyretic.

Benzoin, ben′zō-in, Gum Benzoin, or Gum Benjamin, a balsamic resin, obtained from *Styrax benzoin*, a thick-stemmed tree of Java and Sumatra. It is extracted from the trees, when they are six to eight years old, by incision with a knife; the resin exudes, and is allowed to remain till it hardens into reddish-brown brittle tears, which are subsequently scraped off. The resin has an agreeable odor; when heated it fuses and gives off white vapors of benzoic acid. There are two commercial varieties, the Sumatra and Siam benzoins, which differ as to relative color and degree of opacity of the masses. It is used in medicine and in the manufacture of perfumery and incense. The official preparations are the tincture and compound tincture (benzoin, aloes, storax, Tolu).

Benzoline. See Benzine.

Benzyl Chloride, ben′zil klō′rīd ($C_6H_5CH_2Cl$), a compound obtained by passing chlorine into boiling toluene. It is a pungent-smelling liquid, which is converted into benzyl alcohol on heating with water, and benzaldehyde (artificial oil of bitter almonds) by boiling with water and lead nitrate. *Benzol chlorid* ($C_6H_5CHCl_2$) and *Benzotrichlorid* ($C_6H_5CCl_3$) are also prepared by the prolonged action of chlorine on boiling toluene. These upon oxidation yield benzoic acid. All of these substances are employed in the coal-tar color industry.

Beograd. See Belgrade.

Beöthy, bā′û-ti, Zoltan (1848-), Hungarian author, was born in Komorn. He became professor (1882) of the fine arts at Budapest University, and published a number of meritorious novels, including *Kálózdi Béla* (1875). He also wrote *Rajzok* (sketches, 1879) and a *History of Hungarian Literature* and of *Hungarian Prose.*

Beowulf, bā′ō-wo͝olf, the earliest English epic poem. It was probably composed in the latter part of the seventh century, but the date, and still more the place of action, is matter of discussion. The single ms. is in the British Museum. It is in West Saxon dialect; but most scholars hold it to be a transcription from a northern or midland dialect. The following is a brief outline of the story:

Beowulf, nephew of Hygelac, King of the Geatas, hearing of the ravages committed by Grendel, a monster in human form, at the court of Hrothgar, King of the Danes, sets sail for Hrothgar's court with fourteen companions, is kindly received by Hrothgar, and, lying in wait by night for the monster, succeeds, after a fierce struggle, in tearing off its arm. By means of bloodstains Grendel is traced to his lair, which lies beneath a distant mere. The night following, the king's hall (Heorot) is visited by Grendel's mother, who carries off a noble. Beowulf follows, plunges into the mere, fights with and kills the female monster, cuts off the head of the dead Grendel, and returns in triumph. Handsomely rewarded by Hrothgar, Beowulf returns to his own land, succeeding eventually to his uncle's kingdom, where he reigns happily for some fifty years. At the end of that time a fiery dragon begins to lay waste his country; Beowulf, now an old man, goes forth against the monster, which he succeeds in slaying, but also receives mortal hurt from its flaming breath. The text of the poem has been edited by Zupitza (Early English Text Society) and by Wyatt. There are translations by William Morris and Wyatt, and by Dr. Clark Hall.

Bequest, strictly speaking, a testamentary gift of personal property. The term is, however, frequently employed to denote any gift of property, whether real or personal, by last will and testament, and its use in a will is adequate for either purpose. See Devise; Will.

Berabra, ber-ä′brä, a Nubian people living on both banks of the Nile from Assuan to Wadi Halfa, and scattered south in Kordofan, Dar Fur, and on the banks of the Blue and the White Nile. They number about 50,000, and are industrious agriculturists, and trustworthy.

Béranger, bā-räṅ-zhā′, Pierre Jean de (1780–1857), the greatest of French song writers, was born in Paris, and attended school in Péronne, where even as a child he became imbued with Republican principles. Having quarrelled with his father, he took up his abode in a Paris garret, celebrated in his later verse, and there devoted himself to his poetic aspirations. In 1804 Prince Lucien Bonaparte granted him a pension of $200 a year, and his income was further augmented in 1806, by a clerkship in the office of the Imperial University. By the year 1812 Béranger had found his real vocation—that of a national song writer. Such songs as the world-renowned *Petit homme gris* were succeeded in 1813 by *Roi d'Yvetot*, which first made its author popular. In 1815 appeared *Chansons morales et autres*, including the patriotic pieces, *Les enfants de la France*, *Le Cinq Mai*, *Le vieux drapeau*, and other songs full of biting sarcasm and bitter hostility to the priests and reactionaries. The appearance of a second volume in 1821 led to Béranger's imprisonment, but this served only to increase his popularity and his political influence. In 1825 he published *Chansons nouvelles*, and in 1828 *Chansons inédites*, for which he was tried, fined 10,000 francs, and condemned to nine months' imprisonment in La Force, where he was visited by Hugo, Dumas, Sainte-Beuve, and others. His fifth collection of verse, *Dernières chansons*, written between 1834 and 1851, appeared after his death. Béranger was disinterested, simple, and just, consistently refusing to be bribed by honors or wealth. His songs are instinct with humanity, and overflow with wit, humor, and noble sentiment. Consult his *Ma biographie* (1857); Janin's *Béranger et son Temps;* W. H. Pollock's *French Poets.*

Berar. See Haidarabad.

Berat, ber-ät′, or Bielagorad, town, Albania, on the banks of the Ergene; 30 miles northeast of Avlona and 50 miles southeast of Durazzo, near the site of the ancient Elyma. It is the seat of a Greek archbishop. The surrounding valley is fertile, and the town has trade in agricultural products. Pop. 8,500.

Berber, bûr′ber, town, Nubia, Egypt, on the east bank of the Nile, 30 miles north of its confluence with the Atbara, and nerly 200 miles north of Khartum. The town is noted for its camels. It is a market for cotton, silver work, leather goods, and camel saddles and equipment. Pop. 13,000.

Berbera, ber-bā′rä, seaport, British Somaliland, on the Gulf of Aden; 160 miles southeast of Zeyla. It has a good harbor. An annual fair of inland tribes lasts from October to April, when caravans with the produce of the interior crowd the town. At that period the population increases from about 3,500 to over 20,000. Berbera was occupied by Britain in 1875.

Berberidaceæ, bûr-ber-i-dā′si-ē, an order of 135 species of plants, placed between the buttercup and laurel orders, and found in temperate regions of both hemispheres (except in Africa and Australia), also in tropical mountains such as the Himalayas. All the species of the genus Berberis are shrubby. The flowers of the order are mostly yellow; the perianth leaves are usually in sets of three, of which the inner have honey-glands like the petals of buttercups. The stamens are usually six; the pollen escapes from the anthers by valves, as in laurels. Common barberry, (*Berberis vulgaris*) is found in Europe, Asia, and North America; it forms an ornamental bush, especially in autumn, when its graceful pendulous racemes of small yellow and scarlet berries produce a flame of color. Its use as a hedge is restricted, however, by the attacks of a parasitic cup fungus (*Æcidium berberidis*), the spores of which are blown to fields of wheat, and cause 'rust of wheat,' which is a second stage of the fungus, known as *Puccinnia graminis;* it may also attack other cereals and grasses.

Berbers, a people of Hamitic race ranging over North Africa southwards to the Senegal, forming three-fifths of the population of Algeria, and a still larger proportion of the people of Morocco. Till the ingress of the Arabs in the 1st and 2nd centuries the Berbers had Mauritania for their exclusive habitat. The Moslem invasions of the 7th and 11th centuries drove them inland into the Atlas Mountains, and imposed on them their religion, and in many places their language and usages. They have thus been largely assimilated with the kindred Arabs, from whom they can often be distinguished only by their somewhat coarser features and less finely shaped oval head. Blue eyes and light hair are prevalent in many parts of Morocco, Algeria, and the Sahara, whence comes the now widely accepted view that the Berbers form the original stock of the European races. The term 'Afro-European' has been introduced to express this relation. Sharing the Arab's sense of personal dignity, the Berber, less fanatical, is more settled and more given to husbandry and manufacture. The Berbers, who are believed to represent the Tamahu of the Egyptian monuments, comprise four main divisions—the Kabyles of Algeria and Morocco, as far south as Fez; the Shellala (Shuluhs) of the upland Atlas valleys; the Haratin (Black) Berbers of the south Atlas slopes; and the Saharan Tuaregs. The Imazighen ('freemen,' 'nobles'), as the Berbers generally call themselves, number collectively perhaps 8,000,000.

Berbice, ber-bēs′, river of British Guiana, 350 miles long, with a drainage area of 13,500 square miles. It enters the Atlantic north of New Amsterdam. Vessels drawing 7 feet can ascend the river for 165 miles, but the bar has only 7 feet of water on it at low-water springs.

Berbice, a division in the eastern part of British Guiana, drained by the Berbice River. It has fertile soil, and produces cocoa, vanilla, and tobacco. The capital and chief town is Berbice or New Amsterdam. Pop. about 60,000.

Berceuse, ber-sūz′ ('cradle song'), a melody with a lulling, rocking accompaniment. *Sweet and Low* is a good example.

Berchem, ber*ch*′em, town, Belgium, a suburb of Antwerp. Pop. (1920) 32,853.

Berchem, or BERGHEM, properly NIKOLAAS (or CLAAS) PIETERSZ (1629–83), Dutch painter, son of Pieter Claas, an artist, was a pupil and follower of Weenix. Though he lived in Holland he generally painted Italian scenery and excelled in sunny atmospheric effects. The Wallace collection, the National, Edinburgh, Dulwich, and most Continental galleries contain examples of his work.

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Three Generations of Berbers in Native Costume

Berchet, bâr′shā, GIOVANNI (1783–1851), Italian poet, was born in Milan. He first won recognition in 1816 with his *Lettera semiseria di Grisostomo,* following which his influence, both on the Italian romantic school and on the political ideas of his countrymen, was considerable. Because of his political opinions he was an exile from 1829 to 1848. On his return home in the latter year he was made Minister of Education at Milan. His works, among which are the *Profughi di Parga* (1824), *Clarina,* and *Fantasie* (1829), were collected and prefaced with a biography by F. Cusani (1863). As a poet he was obscure and often commonplace but he nevertheless enjoyed extraordinary popularity.

Berchta, ber*ch*′tä, BERGDA, or BERTHA, a female being in European (chiefly Teutonic) tradition, whose fête-day occurs on or about Epiphany. In the south of Germany she is described as a shaggy monster, with broad 'goose feet,' a long nose (or, according to some accounts, an *iron* nose), who walks round the house at night and tears bad boys to pieces. She rules over nighthags, enchantresses, elves, dwarfs, and the souls of unbaptized children.

Berchtold, berk'tolt, LEOPOLD ANTHONY, COUNT VON (1863–), Austrian statesman, was born in Vienna. He entered the diplomatic service, and in 1895 was made secretary of the Austrian embassy in Paris, going to London as counselor of legation in 1899 and to Russia in 1903. He was ambassador at St. Petersburg in 1905–11 and in 1912–15 was foreign minister of Austria-Hungary. He was appointed Lord High Steward to Charles Francis Joseph in 1916, but after the fall of the royal house retired from politics.

Berdichev, ber-dyē'chef, town, Union of Socialist Soviet Republics, in the Ukraine; 115 miles southwest of the city of Kiev. Its chief products are iron goods, tobacco, ribbons, sugar, and leather. It is the site of the ancient monastery of the 'Barefooted Carmelites.' Pop. (1926) 51,536.

Berdyansk, ber-dyänsk', seaport, Russia, capital of a district in Taurida government, on the Bay of Berdyansk; 265 miles northeast of Simferopol. It has a good harbor and is a great centre of grain trade and to a less extent of salt and coal. There are extensive manufactures of reaping-machines. Pop. about 30,000.

Berea, be-rē'*a*, town, Kentucky, in Madison County, on the Louisville and Nashville Railroad; 34 miles southeast of Lexington. It is the seat of Berea College, a non-sectarian institution (q.v.). Pop. (1910) 1,510; (1920) 1,640.

Berea, town, Ohio, in Cuyahoga County, on the New York Central, the Baltimore and Ohio, and the Cleveland, Cincinnati, Chicago and St. Louis Railroads; 13 miles southwest of Cleveland. It is the seat of Baldwin-Wallace College, a Methodist Episcopal institution, and is noted for its grindstone quarries. Pop. (1910) 2,609; (1920) 2,959.

Berea, a suburb and park at Durban, or Port Natal, Natal, South Africa, beautifully situated above the harbor.

Berea College, a non-sectarian institution in Berea, Kentucky, founded in 1855. The whole plant comprises four separate schools, the College; the Normal School, which trains students for teaching in the rural schools and includes the work of the tenth, eleventh and twelfth grades; the Academy, which is a senior high school accredited by the Association of Colleges and Secondary Schools of the Southern States; and the Foundation-Junior High School, offering work through the first nine grades. No student is admitted under fifteen years of age, and very few students are accepted who come from outside of the mountain region. As a college, Berea is recognized by the Association of Colleges and Secondary Schools of the Southern States and by the Association of American Universities. There is no tuition charge. Every student gives daily service in payment in part or whole for his privileges. They man the power plant, care for the grounds and buildings, even help to erect the latter, cook and serve their own food, and as craftsmen manufacture a large amount of products for which there is an outer market. The institution also offers vocational work in the fields of agriculture, home economics, industrial arts, weaving, nursing and business. For recent statistics see Table under the heading COLLEGE.

Ber'eg, county, Czechoslovakia, in the eastern part, between the river Tisza (Theiss) and the Carpathians. It is well wooded and has deposits of iron and alum. Pop. 225,000, nearly one-half being Ruthenians and one-ninth Germans, the rest Magyars. The chief town is Beregszasz.

Berendt, bā'r*e*nt, KARL HERMANN (1817–78), German ethnologist, was born in Danzig. He studied medicine at Königsberg and from 1843 to 1851 practised in Breslau, lecturing at the university in that city. In the latter year he went to America, having been concerned in the revolution of '48. He travelled and resided in Nicaragua and Mexico, engaged in the study of the ethnology and linguistics of the Mayan tribes, making his headquarters in Washington, D. C., and preparing a number of reports for the Smithsonian Institution.

Berengar I., bā'ren-gär, king of Italy (d. 924), was crowned king in 887, and emperor of the West in 915. His reign was marked by successive struggles with his own turbulent nobles, and with invading Saracens, Hungarians, and Burgundians. In 904 he imprisoned Louis, king of Lower Burgundy, and blinded him, but in 923 suffered a crushing defeat at the hands of Louis' successor, Rudolf. Berengar was assassinated at Verona in the following year.

Berengar II., son of Albert, Marquis of Ivrea, and grandson of Berengar I., was crowned king in 950. His rule was arbitrary, and in 961 he was deposed by Otto I., emperor of Germany.

Berengaria, bä-ren-gä'rē-ä (?–*c.* 1230), queen of Richard I. of England, was the daughter of Sancho VI. of Navarre. While Richard was on his way to the Crusades in 1191, she was married to him in Cyprus, whither she had gone with Eleanor, the king's mother. She remained for a time in Acre but leaving there in 1192, she proceeded to Rome and later resided in Poitou.

Berengarius of Tours (998–1088), French theologian, was born in Tours. About 1040 he became director of the cathedral school of St. Martin's, but developing liberal views concerning transubstantiation, he was condemned by a Church synod, and was imprisoned by Henry I. of France. Rescued by friends, in 1059 he reached Rome, where he retracted his views, but, returning to Tours, promulgated them anew. Persecuted by Pope Gregory VII. and Lanfranc of Canterbury, he retired to St. Côme, near Tours, where he spent the rest of his days. A selection from his works was published by Vischer in 1834.

Berenice, ber-e-nī'sē (mod. *Sakayt-el-Kubla*), ancient seaport, Egypt, on the west coast of the Red Sea, 20 miles southwest of Cape Ras Benas. It was founded (225 B.C.) by Ptolemy II. and was once an important trading centre. Numerous interesting sculptures and inscriptions have been found here.

Beresford, ber'es-f*e*rd LORD CHARLES WILLIAM DE LA POER (1846–1919), noted British admiral, a son of the fourth Marquis of Waterford, was born in Waterford, Ireland. He entered the navy in 1859, became a captain in 1882, and rear admiral in 1897. He commanded the *Condor* at the bombardment of Alexandria in 1882; was in charge of the naval brigade at the battles of Abu Klea, Abu Kru, and Metemmeh; and took the steamer *Safia* up the Nile to the rescue of Sir Charles Wilson's party. In 1875–76 he accompanied the Prince of Wales (Edward VII.) to India. From 1874 to 1880 he represented Waterford in Parliament; from 1885 to 1889, Marylebone; from 1898 to 1900, York; and in 1902, Woolwich. From 1886 to 1888 he was a lord of the Admiralty, resigning on the ground that his colleagues were not providing for the proper organization of the navy. In 1903 he resigned his seat in Parliament on his appointment as commander in the Channel squadron. In 1905, from second in command he was appointed commander-in-chief in the Mediterranean, and in 1907 of the Channel fleet. He retired from active service in 1911. He compiled, with Mr. H. W. Wilson, a *Life of Nelson* (1898). He also wrote *The Break-up of China* (1899), *The Betrayal* (1912), and essays on naval affairs.

Beresford, William Carr, Viscount Beresford (1768–1854), British general, saw service at Toulon with Hood; in Corsica, Egypt, and the Cape (1805); and commanded the regular troops when Sir Home Popham seized Buenos Aires in 1806. After these troops were captured, Beresford made his escape (1807), and served in the Peninsula under Moore. In 1809 he undertook the reorganization of the Portuguese army, helped to win the battle of Busaco (1810), commanded at the battle of Albuera (1811), and took part at Badajoz, Salamanca, and Toulouse (1814). He was made a baron in 1814, and a viscount in 1823.

Berezin, ber-yā′zēn, Elias Nicolaievitch (1818–96), Russian Orientalist and traveller, was born in Perm. After serving as professor in the University of Kazan, in 1842 he began a series of journeys in Asia Minor, Persia, Egypt, and afterward (1848) in Siberia, for linguistical and ethnographical studies. After 1855 he was professor of the Turkish language at St. Petersburg University, director of the Oriental Numismatic Museum in St. Petersburg, editor of the Oriental part of the great Russian *Encyclopædia*, and published several important books in Russian. The only book in French is *Recherches sur les dialectes musulmans* (2 vols. 1848–53).

Berezina, ber-yā′zē-nä, river in Russia, rising in Minsk government and joining the Dnieper after a course of 340 miles. It is famous for the disastrous passage of the French Grand Army during its retreat (1812). The Berezina Canal unites the river with the West Dvina.

Berg, ber*ch*, Duchy of, a former duchy of Germany, situated on the right bank of the Rhine, between Cologne and Koblenz, with an area of over 1,000 square miles. In 1806 it was ceded to France, and Napoleon made it a grand-duchy under Joachim Murat. At the same time it was enlarged to an area of 6,700 square miles. Its capital was Düsseldorf. At the Congress of Vienna in 1815 it was ceded to Prussia.

Bergaigne, ber-gā′ny′, Abel (1838–88), French Orientalist and philologist, was born in Vimy. In 1868 he was appointed reader in Sanskrit, and later director, at the *Ecole des Hautes Etudes* at Paris; afterward he became professor of Sanskrit and of comparative grammar at the Sorbonne. Among his numerous works are *Essai sur la construction grammaticale* (1873); *La religion védique d'après les hymnes du Rig-Veda*, his most important work (1878–83); *Les inscriptions sanscrites du Cambodge* (1882); *Chronologie de l'ancien royaume Khmèr* (1884); *Manuel pour étudier la langue sanscrite* (1884); *Etudes sur le lexique du Rig-Veda* (1885); and several translations from the Sanskrit. After his death appeared *Manuel pour étudier le Sanscrit védique* (1890), a work in which he was assisted by V. Henry.

Bergamo, bâr′-gä-mō, province, Italy, partly in the Lombardy Plain and partly in the Dolomite Alps; area, 1,076 square miles. It has pastoral, agricultural, and manufacturing (silk, cloth, machinery) interests. Pop. (1921) 555,686.

Bergamo (anc. *Bergomum*), town, Italy, capital of the province of Bergamo, stands at the foot of the Alps; 34 miles northeast of Milan. It consists of a mediæval old town crowning a hill 480 feet above the new town. In the former, among the features of interest are the cathedral (begun in 1350), a 9th century church with the tomb of Donizetti, and the library of the Broletto (1354). The business quarters are in the new town, the chief industries being the manufacture of cottons, silks, cloth, hats, paper, and metal wares. Its churches and the Carrara Academy contain paintings by Lorenzo, Lotto, Moroni, Romanino, and other artists of the Lombard school. Pop. (1921) 65,022.

Bergamot, bûr′g*a*-mot, variety of citrus fruit (*Citrus aurantium*, var. *bergamia*) with an aromatic rind from which is extracted oil or essence of bergamot, used in perfumery. The fruit is cultivated chiefly in Italy and France. Certain varieties of pear, whose flavor recalls that of bergamot, are called by this name.

Bergen, ber*ch′e*n, the Flemish name of Mons (q.v.) in Belgium.

Bergen, bar′g*e*n (formerly *Björgvin*), town and seaport, Norway, built on a hilly peninsula separated from the mainland by the narrow Buddefjord. In the background rise seven hills ranging from 932 to 2,100 feet in height. The climate is mild and humid and the city is a popular resort. Among the interesting features are the cathedral, the ancient church of the Holy Cross, the Vestlandske Museum, the Bergenhus, the Mariakirche and the Hanseatic Museum. Fishing is the leading industry and the fish market where the fish are kept alive in tanks until sold is interesting. The spacious harbor is protected against the northwest wind by a mole. Bergen is the chief tourist centre for Western Norway. It is the birthplace of the poets Holberg (1684) and Welhaven (1807), the violinist, Ole Bull (1810), and the musician Grieg (1843).

Historically, Bergen is one of the most ancient and interesting towns in Norway. Founded by King Olaf Kyrre about 1070–75, it was an important trading place in the 12th century, and attracted the North German merchants. In 1181 a great naval battle was fought off the headland Nordnes, between Kings Sverre and Magnus. In 1198 the Clerical party of the Bagler besieged King Sverre in his fortress, and in the beginning of the 13th century there were several battles fought here between them and the popular party of the Birkebeiner. The first coronations of the Norwegian kings were held at Bergen, and some were buried there. From 1164 to 1271 several Rigsdags assembled at Bergen. From the middle of the 13th century the Hansa League made its influence felt at Bergen, and in 1343 erected its own factory, which survives in the Tsykebryggen. In 1665 the town was the scene of an engagement between the English fleet and the combined Dutch fleet and Norwegian garrison. Pop. (1920) 91,443.

Bergenfield, town, New Jersey, on the West Shore Railroad; 10 miles east of Paterson. The leading industries are ice and ice cream making. Pop. (1910) 1,991; (1920) 3,667.

Bergen-op-Zoom, ber*ch′e*n op-zōm, town, Netherlands, in the province of North Brabant, near the head of the East Scheldt; 20 miles north of Antwerp. The leading industries are pottery and brick making. It was formerly a strong fortress but was taken by the French in 1747. Pop. (1926) 20,930.

Bergen Point, bûr′g*e*n, village, New Jersey, now a part of Bayonne (q.v.).

Bergerac, ber-zh′råk′, town, France, in the department of Dordogne, on the right bank of Dordogne River, 55 miles east of Bordeaux. It is a flourishing industrial place. Besides flour mills, breweries, and paper mills, there are foundries, workshops for the making of railway supplies, and chemical factories. The celebrated white wine Montbazillac is produced in the neighborhood. Bergerac was English in 1450. Pop. (1921) 17,041.

Bergerac, Savinien Cyrano de (1619–55), French author, was born at Château de Bergerac in Périgord. He went to Paris, and served with distinction in the army (1639–41). Always of a turbulent disposition, he fought many duels, mostly in consequence of insulting or satirical references to his unusually large nose. His work while not having great literary value is important in its influence on realism. The most famous productions of his pen are *Histoire comique des etats et empires de la lune* (1656), and a corresponding *Histoire comique . . . du soleil* (1661), books written in a mocking spirit. Besides these he wrote a satire on Mazarin, a tragedy, *Agrippine* (1653), and one of the earliest French comedies of character in *Le pédant joué* (1654). Bergerac is the subject of a modern play by the French poet Rostand; the title rôle was first played (1897) by Coquelin.

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Bergen as Seen from Surrounding Hills

Bergh, bûrg, Henry (1820–88), American humanitarian, was born in New York City, and was educated at Columbia University. He passed several years in Europe, and was U. S. secretary of legation at St. Petersburg (1862–4). On his return to America he began his campaign against cruelty to animals; in 1866 the New York legislature passed the laws suggested by him; and the Society for the Prevention of Cruelty to Animals (see Cruelty to Animals) was organized with him as president. Bergh devoted the rest of his life to this reform, and lived to see similar societies established in nearly all the States and in several foreign countries. In 1874 he founded the Society for the Prevention of Cruelty to Children. (See Children, Cruelty to.)

Bergh, Johan Edvard (1828–80), Swedish landscape painter, was born in Stockholm; the forerunner of the modern school. He studied at the Rhineland Academy in Paris, and in Geneva under Calame. His delicate landscapes, which are full of sentiment, are painted with fresh, clear color. His *View of Uri* is in the Berlin Academy. After 1861 he was professor in the Academy of Stockholm.

Berghaus, ber*ch*'hous, Heinrich (1797–1884), German geographer, was born in Cleves. He was professor of mathematics at Berlin (1824–36), and afterward director of the geographical school at Potsdam. The best known of a vast number of charts is his *Physikalischer Atlas.* He also published a German edition of Catlin's *Indians of North America.*

Berghaus, Hermann (1828–90), German cartographer, nephew of Heinrich Berghaus (q.v.), was born in Herford in Westphalia, and was employed after 1850 in Gotha, where he died. He prepared several maps for the atlases of Stieler and Sydow, and published numerous charts, as *General Map on Mercator's Projection* (1859; 2d ed. 1869); the eleventh edition of the *Chart of the World* (1866); *Mural Physical Map of Europe* (1875); *Map of the Alps* (1878); *Mural Physical Map of Africa* (1881).

Bergk, berk, Theodor (1812–81), German humanist, was born in Leipzig. He filled the chair of philology at Marburg (1842), Freiburg (1852), Halle (1857), and Bonn (1869). He is best known for his *Poetæ Lyrici Græci.*

Bergman, ber*ch*'män, Torbern Olof (1735–84), distinguished Swedish chemist and mathematician, was born in Katherinberg. He studied at Upsala, where (1758) he became professor of physics, and subsequently of mineralogy and chemistry. He developed the theory of the determination of chemical processes by the various degrees of affinity between substances, which was corrected by Berthollet in his conclusion that the quantitative difference of the substances concerned is also a factor in such determination.

Bergmann, Karl (1821–76), German-American musician, was born in Ebersbach, Saxony, and went to New York in 1848. He was himself a virtuoso with the piano and violoncello, and composed much orchestral music. Professor Bergmann was conductor of the Germania Society at New York (1850–2); first produced German opera at Niblo's Garden (1856), and was a leader in German-American musical affairs. For some years before his death he conducted the New York Philharmonic Society concerts.

Bergmehl, an infusorial earth. See Kieselguhr.

Bergson, berg'sôn, Henri Louis (1859–), French philosopher, was born in Paris. After leaving the Ecole Normale Supérieure, he was professor of philosophy at several lycées from 1881 to 1900, when he became professor at the Collège de France. In 1901 he was elected a member of the Academy of Moral and Political Sciences, and in 1914 of the French Academy. Bergson's philosophical ideas have had considerable influence on contemporary thought. According to them, the fulness of reality cannot be grasped by the intellect because the universe is continuously changing, whereas concepts are fixed. The mind is an instrument of action, created by life, the whole of which it is therefore incapable of grasping. Intuition is the interpreter, which alone can perceive the *élan vital* (life impetus) at the heart of reality. His writings, characterized by lucidity of style and richness of imaginative illustration, include *Time and Free Will* (1910); *Matter and Memory* (1911); *Laughter* (1911); *Creative Evolution* (1911); *La Perception du Changement* (1911); *Dreams* (1914); *Life and Matter at War* (1915); *Mind Energy* (1920). Consult William James' *Pluralistic Universe* (1909); Gillouin's *Henri Bergson* (1911); Coignet's *De Kant à Bergson* (1911); Stewart's *Critical Exposition of Bergson's Philosophy* (1911); Lindsay's *Philosophy of Bergson* (1911).

Bergström, berk'strôm, Hjalmer (1868–1914), Danish playwright, taught in the Broksche Commercial School (1893–1905) and was a member of the Danish commission to preserve that country's neglected manuscripts. Among his dramatic works are *Ida's Wedding* (1902); *Mint Street 39* (1904); *Lynggaard & Co.* (1905), which has been translated into English by Björkman; *Karen Borneman* (1907), also translated by Björkman; *The Golden Fleece* (1908); *The Birthday Party* (1910); *The Way to God* (1912).

Bergues, berg, fortified town, department of Nord France, is situated at the junction of three canals, one of which connects it with the sea; 5 miles southeast of Dunkirk. Noteworthy buildings are the Hôtel de Ville, containing an interesting collection of paintings, and the church of St. Martin, with a Gothic belfry of the 16th century. There are salt and sugar refineries and manufactures of beer and oil. Bergues has frequently been captured by French, Spanish, Dutch and English forces but in 1793 it successfully resisted the English. Pop. (1911) 4,856.

Bergün, (Romansh, *Bravuogn*), ber'gün, a finely placed village and summer resort (alt. 4,544 ft.) in the Swiss canton of the Grisons, on the route over the Albula Pass. It is 19½ miles by road from Thusis, and 30½ miles from Ponte, in the Upper Engadine. These distances, however, are shortened by the railway under the pass (opened in 1903). Pop. 1,300.

Berhampore, bur'um-po͝or *or* po͝or' (Bahrampur), municipal town, Murshidabad district, Bengal Presidency, India, on the Bhagirathi River, 5 miles south of Murshidabad. It was formerly a cantonment, but the old barracks are now occupied by courts and municipal offices. There is a first-grade college. Industries include oil pressing and cane and bamboo work. It was the scene of the outbreak of mutiny in 1857. Pop. (1911) 22,777.

Berhampur, bur'um-po͝or *or* po͝or' (Barampuram), municipal town, Ganjam district, Madras Presidency, India; 16 miles southwest of Ganjam. It was until recently a cantonment for native troops. It has a college, a district jail, and a hospital. There is a large trade in sugar and silk. Pop. (1911) 31,456.

Ber'iber'i, a disease due to the use of a diet lacking in the accessory food factors, or vitamines (q. v.). It consists in a polyneuritis and a myocardial degeneration like those resulting from acute diphtheritic toxemia. It is commonly a subacute or chronic malady, but may be sudden in onset and rapidly fatal from acute heart failure.

Beriberi is endemic in extensive parts of Eastern Asia, in the tropical and subtropical zones, including China, Indo-China, Japan, the Straits Settlements, and the Dutch East Indies, and is prevalent in the Philippines. Its occasional epidemic occurrence depends upon certain restrictions in the diet of large bodies of men, as in institutions, on sailing vessels, or under military service conditions.

The subacute and mild forms, which constitute the bulk of cases, begin insidiously and run an afebrile course. Gastric symptoms may be absent at the onset, and the patient usually comes under notice for gradually increasing weakness and aching pains in the legs. Slowly, a typical polyneuritis develops, which tends to become chronic unless treated early and thoroughly. Symptoms due to cardiac weakness also come on—breathlessness on exertion, palpitations, giddiness, precordial distress, and tachycardia. When the neuritis is of long standing, muscular atrophy and contracture deformities of the limbs usually develop, continuing sometimes for years.

In *treatment* the correction of dietary defects is of primary importance. In the East, where the disease is due to an almost exclusive diet of decorticated rice, this food must be replaced by the undermilled variety, or be supplemented by the addition of rice bran. For the polyneuritis, rest is indicated, and strychnine is valuable, as are hot-air baths, massage, and active and passive movements. The cardiac symptoms require appropriate measures.

Bering, bē'ring; *Dan.* bā'ring, or Behring, Vitus (1680–1741), explorer, was born in Horsens, Jutland. Taken (1706) into the Russian naval service, he so distinguished himself in the wars against Sweden that Peter the Great charged him (1725) with the conduct of an exploring expedition. Reaching Kamchatka, he determined (1728) that Asia was not, as supposed, joined to America. Later, in 1741, he traversed the Sea of Okhotsk and made the north coast of America (Alaska) but died on Bering Island. An account of the voyage was written by the survivor, Steller. Consult also Laridsen's *Life*.

Bering Sea (Behring), named from Vitus Bering (q. v.), the most northerly division of the Pacific Ocean, from which it is demarcated by the Aleutian Islands (q. v.). Its area is estimated as 878,000 square miles and its greatest depth, in the south, as 13,422 feet. On the north, Bering Sea communicates with the Arctic Ocean through Bering Strait, about 50 miles wide, which is narrow, shallow, and bordered by bare, rocky shores. On the west it washes the shores of Northern Asia and on the East the shores of Alaska. It receives the Yukon River from Alaska, and the Anadyr from Siberia. From November to May, it is generally impassable, owing to fog and ice. A cold current flows from the Arctic Ocean through Bering Strait; a warm current runs through it from the Pacific. A proposal to tunnel under the strait and link the Siberian Railway with the Canadian system has been made but has been adjudged impracticable owing to the depth of water in the strait (160–170 feet). Consult De Windt's *Through the Gold Fields of Alaska to Bering Strait.*

Bering Sea Controversy, a dispute between the United States and Great Britain, arising out of the practice of pelagic sealing in the Bering Sea. In order to check the rapid diminution of the herd, the United States claimed (1) that the Bering Sea is a closed sea, over which the United States has exclusive jurisdiction; and (2) that seals are domestic animals, and therefore American property wherever captured. The contentions of the American Government were overruled by the High Court of Arbitration, provided for by the Blaine - Pauncefote treaty of 1892, which convened in Paris in March of the following year, under the presidency of Baron de Courcel, the French representative. The arbitrators further decided that a zone of sixty miles around the Pribylov Islands, the property of the United States, should be established, within which the pursuit, capture, or killing of seals by the citizens of either of the governments should be prohibited; they established a close season, from May 1 to July 1, and laid down other rules for vessels engaged in sealing.

The regulations adopted to prevent indiscriminate slaughter of seals proved ineffectual, although pelagic sealing was forbidden by the United States to American citizens. Several later commissions considered the question anew, and in December, 1911, a convention, effective for fifteen years, was proclaimed between the United States, Great Britain, Russia, and Japan, prohibiting the citizens of those countries from engaging in pelagic sealing in the Pacific Ocean north of 30 degrees north latitude. See SEALS AND SEAL FISHERIES. Consult Stanton's *Bering Sea Controversy; National Geographic Magazine* (December, 1911).

Bering Strait. See BERING SEA.

Beriot, bā-rē-ō', CHARLES AUGUSTE DE (1802–70), Belgian violinist, the husband (1836) of Malibran (q. v.), the eminent vocalist. He was professor in the Conservatory of Music in Paris (1843), and of Brussels (1843–52), and composed numerous popular works for the violin.

Berislav, bye-rē-slȧf', or BORISLAV, town, Ukraine, is situated on the right bank of the Dneiper River, 45 miles northeast of Kherson. It has a large trade in grain. A town called Kize-Kerman is reported to have been founded here by the Turks about 1450, but was wrested from them in 1696 by Peter the Great and renamed Berislav. Pop. about 12,000.

Berja, ber'hä, town, province Almeria, Spain; 31 miles west of Almeria. It is situated in a mining and fruit-growing district, exports grapes, and has foundries, cotton mills, and candle works. Pop. 15,000.

Berkeley, bûrk'li, city, California, Alameda county, on San Francisco Bay, and on the Southern Pacific and the Atchison, Topeka, and Santa Fé Railroads; 10 miles northeast of San Francisco. It is the seat of the Letters and Science Colleges of the University of California; the university's Greek theatre (seating 12,000) and stadium (seating 24,000); the State Agricultural and Mechanical College, and the State Institution for the Deaf, Dumb, and Blind; seven private schools and colleges, and a high school accommodating 1,200 pupils. Formerly almost exclusively a residential city, it has retained and extended many of the industries that were driven across the bay by the San Francisco earthquake and fire in 1906. According to the Census of Manufacturers for 1919, it had 114 industrial establishments with a total capital of $16,565,000, and products valued at $28,332,000. These include foundries, canneries, and manufactures of gloves, candy, furniture, glass, pumps, machinery, matches, castings, chemicals, boots and shoes, gypsum, and soap. The commission form of government was adopted in 1909. A movement to amalgamate the bay cities has thus far been unsuccessful. Pop. (1900) 13,214; (1910) 40,434; (1920) 56,036.

Berkeley, bürk'li *or* bärk'li, parish and market town, Tewksbury division, Gloucestershire, England, on the River Avon, 15 miles southwest of Gloucester. Berkeley Castle, a splendid example of early feudal architecture, was the scene of the murder of Edward II. (q. v.), in 1327. Edward Jenner (q. v.), the discoverer of vaccination, was a native of the town. The Vale of Berkeley is famous for Gloucester cheese. Pop. of parish (1911) 6,554; (1921) 4,687.

Berkeley, GEORGE (1685–1753), Irish metaphysician and philanthropist, was born in Dysert, Kilkenny. In 1700 he entered Trinity College, Dublin; in 1707 he published his first works, *Arithmetica* and *Miscellanea Mathematica*, and in 1709 he took orders. In his *Essay toward a New Theory of Vision* (1709) he argued that the immediate objects of sight are all mind-dependent appearances, which form what is practically a natural language whereby mankind are 'instructed and regulate their actions.' This essay was followed by the *Principles of Human Knowledge* (1710), in which he boldly represents as 'self-evident truth' that all those bodies which compose the mighty fabric of the world could have no real subsistence after the extinction of all percipient mind, nor active power after the extinction of all voluntary agency. By an unmetaphysical generation this was supposed to imply that the material world is only an idle dream, having no practical significance. To correct this misunderstanding, Berkeley published *Three Dialogues between Hylas and Philonous* (1713), in which the questions at issue are discussed after the manner of Plato.

His next eight years were spent in England, France, and Italy. In 1713 he is found in London, introduced by his countrymen Swift and Steele to the brilliant society in which Addison and Pope were prominent. He again visited France and Italy, as chaplain to the Earl of Peterborough, in 1714, and was once more abroad from 1716 till 1720.

Berkeley's return to England in 1720 marked an era in his life. He found the country disturbed, economically and socially, by the South Sea Scheme (q. v.). The prevailing tone of morals shocked him, with its indifference to lofty ideals, and its selfish secularism, which had taken the place of the fanatical spirituality of the preceding century. He proposed a remedy in a fervid *Essay toward Preventing the Ruin of Great Britain* (1721).

Despairing of the Old World, and ready to look elsewhere for Utopia, he told his friend Lord Percival, in 1723, that he was determined to spend the rest of his life in Bermuda, at the head of an institution which might become a fountain of Christian civilization for the American Indians. To the carrying out of this project all his energies were now directed. In 1724 preferment came in the form of the deanery of Londonderry. Later in the same year he moved to London, where he spent the four following years collecting money for his enterprise, for which he proposed to surrender the deanery. His social charm and enthusiasm attracted Sir Robert Walpole, and a promise of $100,000 for Bermuda was voted by the House of Commons. In 1728 we find him, newly married to the daughter of the Speaker of the Irish House of Commons, embarked, on his way to Bermuda, for Rhode Island, where he waited for three years for the promised endowment. During his residence in Rhode Island he officiated in Trinity Church, Newport. He was in the end disappointed by Walpole, and in 1731 returned to London, where he published (1732) *Alciphron; or, The Minute Philosopher*, a book of dialogues on the philosophy of religion, pondered and prepared in the seclusion of Rhode Island. A supplementary tract on *Visual Language*, 'showing the immediate presence and providence of a deity,' appeared a year after *Alciphron*.

The year 1734 was another turning point in Berkeley's life, when he became bishop of Cloyne by the favor of Queen Caroline. The change found him on the eve of a controversy concerning *mysteries* in religion, suggested by a dialogue in *Alciphron*—its mysteries being fatal to its authority, according to certain freethinking mathematicians. The *Analyst* (1734) was Berkeley's rejoinder, in which he showed that even mathematics is as open as religion to the charge of ultimate mystery.

The social state of Ireland next engaged his attention. In the *Querist* (1735–7) he raised questions of political economy that anticipated David Hume and Adam Smith. Berkeley's philanthropic zeal found varied exercise. In 1739 the diocese of Cloyne was ravaged by famine and fever. His American experience reminded him of the marvellous medicinal properties of tar, and his own experiments served to expand the conception. It assimilated curiously with studies in Plato, the Neoplatonists, and the mystics, in which he had been immersed for years; an eccentric ingenuity connected the medicine with metaphysics; and tar, as a possible panacea, suggested the final interpretation of the universe. This train of thought found expression in *Siris* (1744), the most curious book in English metaphysics, and Berkeley's last word on philosophy. Its profound speculation was, however, obscured by the prolonged controversy to which its therapeutic doctrines gave rise. Indifferent health induced Berkeley in 1752 to remove from Cloyne to an academic home in Oxford, where he died in 1753. He was buried in the cathedral of Christ Church.

One need not look in Berkeley's works for an all-comprehensive system, as in Spinoza or Hegel. 'I had no inclination,' he tells his friend Johnson, 'to trouble the world with large volumes. What I have done was rather with a view to giving hints to thinking men who have leisure and curiosity to go to the bottom of things and pursue them in their own minds.'

The works of Berkeley first appeared in a collected form in 1784. About the middle of the nineteenth century he began to receive more sympathetic treatment in Britain from Ferrier and Collyns Simon; also, from a different point of view, in essays by Campbell Fraser (1863–4); and in 1871 the University of Oxford published an annotated edition of the *Collected Works* (3 vols.) by Professor Fraser, along with a supplementary volume of *Life and Letters*. Those works which had been published in his lifetime appeared in 1898, with a biographical introduction by the Right Hon. A. J. Balfour. Consult Fraser's *Berkeley* (Blackwood's 'Philosophical Classics'); *Works* (edited by Fraser); Mill's *Three Essays on Religion;* Schwab's *Der Utilitarismus Berkeleys; The Querist* (new ed. by Johns Hopkins Press, 1910); Mead's *Bibliography of George Berkeley, Bishop of Cloyne* (1910).

Berkeley, SIR GEORGE CRANFIELD (1753–1818), British admiral, son of Augustus, fourth earl of Berkeley, was in 1778 in the *Victory* in the action off Ushant. His captain's commission dated from 1780. At the relief of Gibraltar, in 1782, he was in command of the frigate *Recovery*, and at Lord Howe's victory in 1794 was wounded while in command of the *Marlborough*. In 1799 he was in command of a squadron blockading Brest, and in 1810 became an admiral in the British navy. He was also lord high admiral of Portugal. He was M.P. for Gloucester (1781–1812).

Berkeley, JAMES, THIRD EARL OF (1680–1736), British admiral, known in earlier life as Lord Dursley, was made a captain in 1701, and commanded the *Boyne* with great credit in Rooke's action off Malaga in 1704, and the *St. George* at the siege of Toulon. In 1717 he was appointed first commissioner of the Admiralty, and two years later was advanced to the rank of admiral and commander-in-chief of the fleet and vice-admiral of England.

Berkeley, MILES JOSEPH (1803–89), English botanist, was born in Northamptonshire. He was educated at Cambridge, took orders, and in 1868 became vicar of Sibbertoft. He published an *Introduction to Cryptogamic Botany* (1857) and important papers dealing with vegetable pathology, his chief interest being in the study of fungi and fungoid diseases. He contributed the section on fungi to Hooker's *British Flora*, wrote *Outlines of British Fungology* (1860), and for eleven years edited the Journal of the Royal Horticultural Society (1866–77).

Berkeley, SIR WILLIAM (*c.* 1609–77), English colonial administrator, was born probably near London. He was graduated from Oxford in 1629, and served as governor of the colony of Virginia (1642–52 and 1660–77)—his first term being marked by his severity toward the Puritans, and his staunch adherence to the king rather than to Cromwell during the English Revolution; and his second term by his arbitrary and overbearing conduct, and by the outbreak and conclusion of Bacon's Rebellion (q. v.), the participants in which he punished relentlessly. He published a play, *The Lost Lady* (1638), and *A Discourse and View of Virginia* (1663). Consult Wise's *Ye Kingdom of Accawmacke, or the Eastern Shore of Virginia in the Seventeenth Century* (1911).

Berkhamstead, bûrk-ham'sted *or* bärk-ham'sted, or GREAT BERKHAMSTEAD, parish and market town, Hertfordshire, England, 26 miles northwest of London. It has a ruined castle. Cowper the poet was born here in 1731. There are straw plaiting and carved and turned woodware industries. Pop. of the town (1921) 4,746.

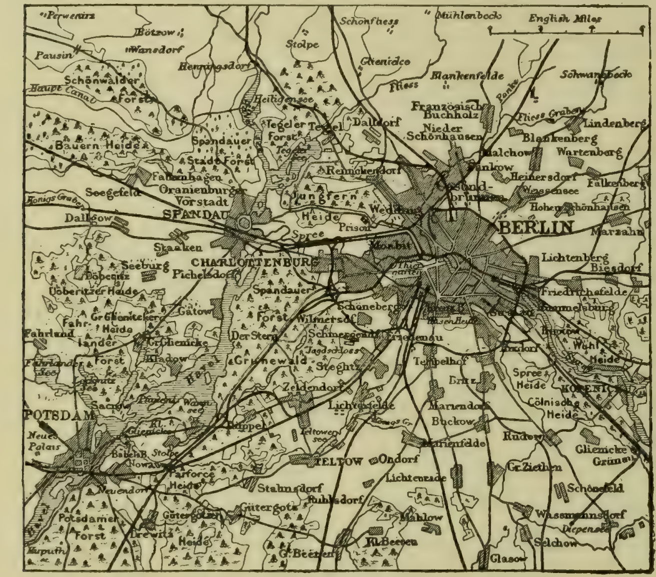
Berkshire, bûrk'shir *or* (in England) bärk'shir, an inland county of England, south of the River Thames and west of Surrey. Within its borders are Windsor Castle, whence it is known as the 'royal county,' and the royal seats of Frogmore, Cumberland Lodge, and Cranbourn Lodge. The surface is generally undulating and moderately well wooded. The principal hills are the Berkshire Downs, or White Horse Hills, with Cumnor Hurst in the northwest and Inkpen Beacon near the southwestern boundary. The county is watered by the Thames, Ock, Kennet, Cole, Lambourn, and Pang. Agriculture and dairy farming are the chief industries. Manufactures are limited, and are mainly centred in Reading (q. v.), the principal town. Whiting is made from the chalk at Kintbury.

Berkshire was the scene of the struggles between Alfred and the Danes in the ninth century, and played an important part in the Civil Wars from the reign of Stephen to the death of Charles I. Interesting historically is the Great 'White Horse,' nearly 400 feet in length, cut on a chalk hillside in Vale of Ock, traditionally said to commemorate the battle of Ashdown (861) but probably pre-Roman. Area, administrative county (1921) 463,830 acres; registration county, 575,152 acres. Population, administrative county (1921) 294,821; registration county, 313,190.

Berkshire Hills, the hill region of Berkshire county, Massachusetts. Lying in the western end of the State, these hills are a continuation of the Green Mountains of Vermont. Though not lofty (few summits exceed 2,000 feet), they are varied and picturesque. Greylock (q.v.), which has an altitude of 3,535 feet, is the highest mountain in Massachusetts. The region has many associations with Hawthorne, Longfellow, Bryant, and other men of letters. It contains several towns noted as summer resorts, and places of historic interest, as Pittsfield, Lenox, Stockbridge, and Great Barrington (qq. v.). Consult Phillips' *Pathfinder to Greylock Mountain, the Berkshire Hills, and Historic Bennington* (1910).

Berlad, bûr'lät, city, Roumania, capital of the district of Tutova, on the River Berlad and the state railway frum Galatz to Jassy. It is situated in an agricultural region, and is an important *entrepôt* for the corn trade to Galatz. Pop. (1914) 25,367.

Berlichingen, ber'li*ch*-ing-*en*, Goetz or Gottfried von, 'of the Iron Hand' (1480–1562), was born in Jagsthausen, Wurtemberg. He was a typical example of the baronial robbers of the Rhine—stern, bloody, and rapacious, but frank, generous, and, after their fashion, courteous. He is the subject of Goethe's tragedy, *Goetz von Berlichingen,* translated by Scott in 1799. At the siege of Landshut (1505) he lost his right hand, and the artificial one which he used in its place was the origin of his nickname. Fighting against the Swabian League, he made a heroic defence of Möckmühl, but was taken prisoner at Heilbronn (1519), and was released only through the exertions of his friends, Georg von Frundsberg and Franz von Sickingen. In the Peasants' War of 1525 he headed a party of the revolted peasants, and after the dissolution of the Swabian League (1540) he took part with Charles V. (1542) against the Turks and Francis I. (1544). His autobiography, edited and published by Pistorius, furnished Goethe with materials for his drama.



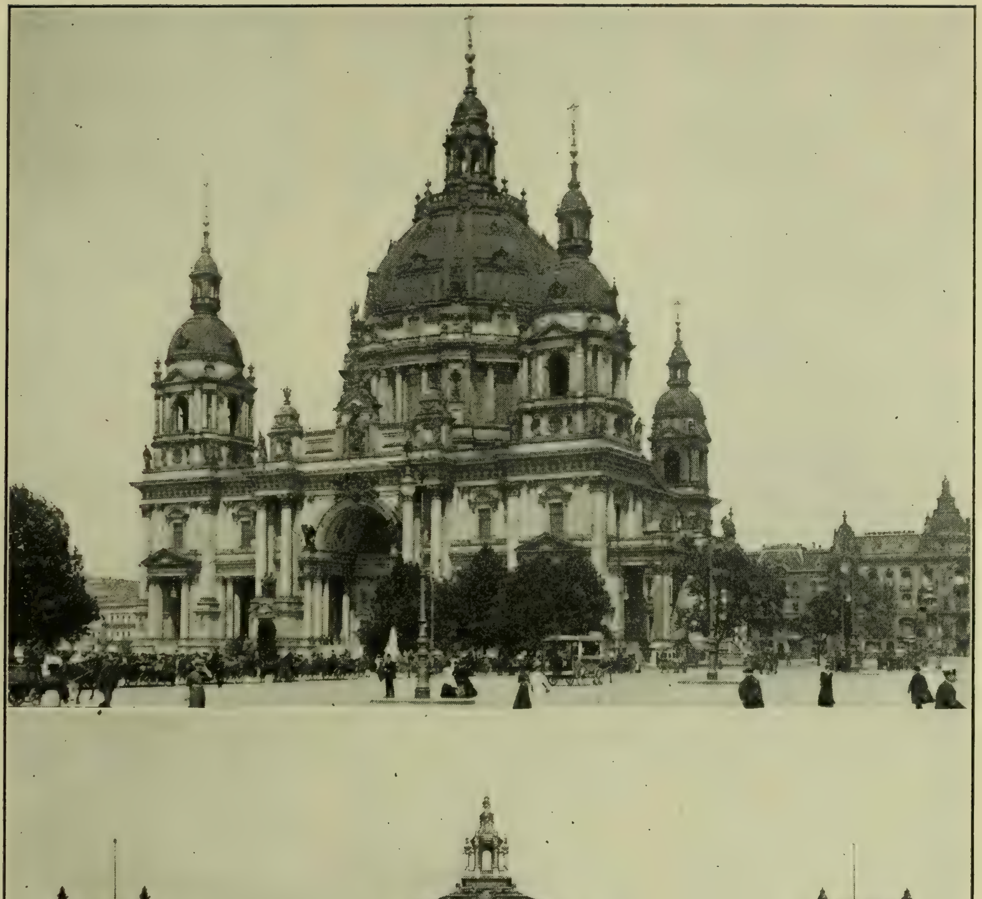
Berlin and Environs.

Berlin, bûr-lĭn'; *Ger. pron.* ber-lēn', city, capital of Germany, is situated on the River Spree, an affluent of the Elbe; 84 miles by rail from Stettin and 178 miles from the North Sea. The Spree, which runs through the centre of the city, is connected with the Oder and the Baltic by canals. It is crossed by a large number of bridges, of which the Palace and Emperor William are perhaps best known. The city is the centre of the North German Railroad system, and has five terminal railroad stations.

Berlin is the most modern of all European capitals. The narrow byways and old walls of the thirteenth-century city have long since disappeared, and wide streets, open squares, and modern buildings have taken their places. On an island in the centre of the city stands the former royal palace, a four-square pile begun in 1451. Opposite it are the old (1824–8) and new (1843–55) Museums—the former containing Greek and Roman works of art, including sculptures and specimens of ornamental and industrial art, the latter housing paintings, engravings and Egyptian collections. Nearby are the National Gallery; the Cathedral, in later Renaissance style (built in 1894–1905 at a cost of $2,500,000); the National Monument to Emperor William I. (1897); the new Pergamon Museum (1925), containing ancient sculptures from several Greek cities of Asia Minor; and facing the river, the Emperor Frederick Museum (1897–1903), in the Italian baroque style.

From the island stretches westward the most famous street in Berlin, 'Unter den Linden' ('under the lime trees'), 198 feet wide and about a mile in length from the Palace to the Brandenburg Gate. It has been largely rebuilt of late years, and is bordered by hotels, shops, and handsome public buildings, including the Arsenal (1695–1706), now used as a military museum and Hall of Fame for the Prussian Army; the Opera House (1741–3); the Royal Library (1,230,000 volumes), completed in 1909 at a cost of $2,500,000; the Town Hall (1861–70); the University; the Palaces of William I. and the Emperor Frederick III., and the monument to Frederick the Great by Rauch (1851). The Triumphal Arch at the west end of the street, the Brandenburg Gate (a copy made in 1788–91 of the Propylæa at Athens), forms the entrance to the large park (630 acres) of the Tiergarten, extending to Charlottenburg. In the east is the magnificent avenue of the Siegesallee ('Avenue of Victory'), adorned (1898–1901) with thirty-two marble groups of the rulers of Prussia and Brandenburg. In the northeast part of the Tiergarten stands the most imposing building of the city, the Parliament building, erected from designs by Wallot in 1884–94, at a cost of more than $5,000,000. In the southwest are the famous Zoölogical Gardens and the Emperor William I. Memorial Church (1891–5). Near the northwest is the royal palace of Bellevue. The Tiergarten Quarter, to the south of the park, bordering the Landwehr Canal, is a fashionable residential section. The canal is crossed by the Potsdam and Victoria and the Hercules bridges.

In Wilhelm Strasse are the Prussian Parliament Houses (1893–8), the Post Office (1871–98), and the handsome Anhalt railroad station (1875–80). The churches of Berlin are generally of brick, the oldest being St. Mary's and St. Nicholas'. The Roman Catholic Church of St. Hedwig is in rotunda form, built in the style of the Pantheon in Rome. Educational, artistic, and scientific institutions are numerous, and some of them are of more



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BERLIN

1. The Cathedral (The Dom). 2. The Meeting Hall of the Reichstag (Reichstagsgebäude).

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than national reputation—*e.g.*, the Observatory, the Seminary for Oriental Languages, high schools for music, the fine arts, and veterinary science, the Academy of Sciences, Industrial Art Museum, Ethnological Museum, Oceanographical Museum (1906), Royal Museum of Traffic and Engineering (1906), and Mining Academy. The city contains, besides numerous theatres and music halls supported by private enterprise; the Opernhaus and the Schauspielhaus, which receive state support.

Other parks of Berlin, besides the Tiergarten, are Exhibition Park, where the annual summer art exhibition is held; the Invaliden, containing the National Warriors' Monument to the soldiers of 1848; Humboldthain (90 acres) and Friedrichshain; Victoria Park (1888–94), and Schiller Park (1909–10).

Berlin has five railway stations to accommodate the thirteen lines which carry through traffic. The Stadtbahn, a city railway, runs from Charlottenburg on the west, to Stralau-Rummelsburg on the east. An electric elevated and underground railroad also serve the city. Tramways traverse the principal streets, centring at Potsdamer Platz. Omnibuses and cabs are also largely used in city transportation.

Higher education is provided by the University of Berlin (see BERLIN, UNIVERSITY OF), the Academy of Architecture, and schools of music, Oriental languages, arts, mining, engineering, artillery, agriculture, and other similar institutions. There are numerous academic, technical, and commercial high schools, secondary and primary schools, and kindergartens. The German Institute for Foreigners offers assistance to those wishing to study the German language and customs.

Berlin is important as an industrial and trade centre, the industrial quarters lying to the northeast, southeast, and northwest of the old town. It is estimated that the electrical industry alone employs 170,000 workers. Brewing is an important industry, and there are manufactures of wool, silk, iron, steel, and their by-products, linen, hats, paper, books, porcelain, pottery, chemicals, confectionery, dairy products, musical instruments, tobacco, shoes, clothing, and jewelry.

Trade is carried on in corn, wines, spirits, and building materials. Economic conditions since the war have been so unsettled that statistics give little idea of the city's commercial possibilities. In a single year preceding the war, the land traffic of Greater Berlin (not including transit) amounted to 12,697,965 tons, and the water-borne traffic to 8,848,900 tons; 60,883 vessels entered the port of Berlin and 25,264 vessels entered the port of Charlottenburg.

Government.—Prior to the Great War Berlin was governed by the Police Department, under the direction of the Prussian Minister of the Interior, and by a Common Council. The police administration had charge of trade regulations, markets, building, criminal and passport regulations, and all matters pertaining to fires and the general order. The Common Council was elected for a term of six years by popular vote, the voters being divided into three classes on the basis of income and taxes. The Council elected the mayor and his immediate advisers. The surrounding towns—Charlottenburg, Schöneburg, Rixdorf, Wilmersdorf, and others—were included in the metropolitan police district of 'Greater Berlin,' but were under separate civil administration.

Following the war a law was enacted (1920) to bring all these communities under a single government, and a new metropolis was created, including, besides the old city, eight formerly independent towns, fifty-nine rural communities, and twenty-seven large agricultural estates. The central government was entrusted to a magistracy of about thirty members and a central council not to exceed 225 in number. The Greater City was divided into twenty districts, each with its assembly and executive body with a mayor at the head. A radical change took place, also, in the franchise. The old division of the voters into classes was done away with, and the universal franchise was established. The city revenues are derived from public utilities conducted by the municipality.

Berlin has long been known for its progressive policy as regards public ownership of utilities, as gasworks, cattle yards, slaughterhouses, markets, and transportation facilities. In 1925, in order to help solve the housing problem, which had assumed serious proportions, the city undertook to advance considerable sums on second mortgages to co-operative construction and private builders, who in turn agreed that rent for the new dwellings should not exceed 115 per cent. of the prewar rates.

Population.—In 1890 the population of Berlin proper was 1,578,794; in 1900, 1,888,848; in 1910, 2,070,695 (of 'Greater Berlin,' 3,702,962). The population of the Greater City in 1919 was 3,803,770. The estimated population in 1924 was 4,000,000.

History.—Berlin was originally a Wendish fishing village named Kölln. First known in the twelfth century, it was granted municipal rights about 1240; and in the middle of the fifteenth century it set up an independent mint and courts of justice. In 1448 it was chosen as their place of residence by the Hohenzollern rulers of Brandenburg. During the Thirty Years' War it was besieged and destroyed by the Swedes and Imperialists, to be rebuilt by Frederick William (1640–88), who began the work of making it one of the finest cities of Europe. This work was continued by Frederick I., Frederick William I. (who named the city Berlin), Frederick the Great, and William II.; but it is from the successful issue of the Franco-Prussian War (1870–1) that the city dates its rapid growth and its pre-eminence. In 1881 it was separated from the province of Brandenburg and made an administrative centre. In 1878 the Berlin Congress (q. v.) of European Powers, and in 1884–5 the Congo Conference, met in the city.

The most important development of the last few decades in Berlin has been the creation of the Greater City under a single administration. With the growth of the suburban communities, the need of some form of centralization became apparent both for the prevention of intercommunity friction and for the more efficient conduct of public utilities.

Accordingly, in 1911 came the creation of what was known as Greater Berlin, whereby the suburban districts associated themselves with the city proper for certain special objects coming under the police administration. The union proved, however, too loose a one to meet the more serious problems arising during the war and in the period immediately following, and in 1920 the old city of Berlin, the outlying cities, rural municipalities, and large agricultural estates were brought together under a central administration, as described above (see *Government*).

Berlin suffered seriously from the general economic disorganization following the war. Unemployment reached serious proportions (235,853 unemployed, Jan. 1, 1924), and was reflected in a lower marriage rate, increased number of suicides, and increased infant mortality. Shortage of food and lack of housing facilities also told heavily, especially on the middle classes. During 1924 and 1925, however, there was a marked change for the better.

Consult *Berlin und seine Bauten*, issued by the Architects'

Association; Ring's *Die Deutsche Kaiserstadt* (2 vols.); historical works by Fidicin, Streckfuss, and Schwebel; Geiger's *Berlin, 1688–1840*, a history of the city's intellectual development; Osborn's *Berlin* (1909); Dickie's *In the Kaiser's Capital* (1910); Paszkowski's *Berlin in Wissenschaft und Kunst* (1910); Eberstadt's *Gross Berlin* (1910); Siepen's *Berlin* (1911); Grieben's *Berlin and Environs* (1912); Bædeker's *Berlin and Its Environs* (1912); Marc Henry's *Trois Villes; Vienne - Munich - Berlin* (1917); Kaeber's *Berlin im Weltkriege* (1921); Laforgue's *Berlin, la cour et la ville* (1922).

Berlin, former name of Kitchener, Ontario. See Kitchener.

Berlin, village, Connecticut, Hartford county, on the New York, New Haven, and Hartford Railroad; 11 miles south of Hartford. It is connected by trolley with Hartford through New Britain, its banking point. There are manufactures of iron and steel, hardware, pressed brick, envelopes, and paper bags and boxes. Pop. (1910) 3,792; (1920) 4,298.

Berlin, city, New Hampshire, Coos County, on the Androscoggin River, the Boston and Maine, and Grand Trunk and New England Lines Railroads; 15 miles northeast of Mount Washington. It has a public library, municipal building, and hospital. Abundant water power afforded by the river is utilized in the manufacture of pulp, paper, and lumber. According to the Federal Census for 1919, industrial establishments number 25, with $39,300,580 capital, and products valued at $30,652,522. Pop. (1900) 8,886; (1910) 11,780; (1920) 16,104.

Berlin, city, Wisconsin, Green Lake and Waushara counties, on the Fox River and the Chicago, Milwaukee, and St. Paul Railroad; 20 miles west of Oshkosh. It has boot and shoe and fabric glove factories, granite quarries, a fur goods factory, brick yards, a milk condensery, and dairy and cranberry interests. Berlin was settled in 1847 and incorporated in 1856. Pop. (1910) 4,646; (1920) 4,400.

Berlin, Congress of (June, 1878), a meeting of representatives of the European powers invited by Prince Bismarck to revise the Russo-Turkish treaty of San Stefano (1878). Its sessions were held in Berlin, in the Radziwill Palace, and Bismarck acted as president. Germany, Austria, Russia, England, France, Italy, and Turkey were represented. Delegates from other European countries were also in attendance but not as members. The Congress recognized the independence of Roumania, Servia, and Montenegro. Bulgaria was reduced in size and became a self-governing Turkish tributary state, with an elected prince not a member of any reigning European dynasty. Eastern Roumania received administrative autonomy and a Christian governor, but remained under the control of the Sultan. Greece was promised a modification of her frontier, which was carried out in 1881. Bosnia and Herzegovina were placed under the administrative control of Austria, while Roumania returned to Russia the Bessarabian territory taken from her by the Treaty of Paris, receiving in return the Dobrudja. Ardahan, Kars, and Batum were ceded by the Porte to Russia. Great Britain, by establishing herself in Cyprus, assumed virtual control of the eastern part of the Mediterranean. See Europe, *History*.

Berlin Decree, a decree issued by Napoleon at Berlin on Nov. 21, 1806, after the Battle of Jena, and marking the beginning of Napoleon's 'Continental System.' The decree declared the British Islands under blockade, prohibited all commerce with them, and ordered all ports to exclude vessels sailing from Great Britain or from any of her colonies. The decree drew forth the British Orders in Council of Nov. 11, 1807, and, in America, was one of the causes which led to the enactment of the Embargo of December, 1807. See Continental System; Embargo.

Berlin'er, Emile (1851–), German-American inventor, was born in Hanover, Germany. He came to the United States in 1870. In 1877 he invented the loose-contact principle of the modern telephone transmitter; and in the same year first used induction coils in connection with telephone transmitters. He has patented many other valuable inventions connected with the telephone. He was chief instrument inspector of the Bell Telephone Company from 1879 to 1882. In 1887 he invented the gramophone (see Phonograph). He was the first to make and use in aeronautic experiments a light-weight revolving cylinder internal combustion motor which was later used on aeroplanes. After 1901 he became active in the campaign against impure milk and other dairy products and wrote pamphlets on various phases of hygiene. He acted as president of the Washington Tuberculosis Association (1917–22).

Berlin, University of (Friedrich Wilhelm University), dates its foundation from 1809. When Napoleon I. suppressed the University of Halle, Friedrich Wilhelm III., advised by Schmalz, Fichte, Schleiermacher, Wolf, and other men of prominence, planned for a new university to take its place in Prussia. Through Wilhelm von Humboldt, then minister of the education department, these plans were brought to completion at the end of 1808; the new university was placed under the direction of the Minister of the Interior; an appropriation of 150,000 talers was made; and the Palace of Prince Henry of Prussia, on the Avenue Unter den Linden, was set aside for its use. In 1810 the University opened, with some of the faculty from the University of Halle on its staff. Among the first corps of teachers were Hegel and Niebuhr. Other illustrious men who have served on the faculty are the Grimm brothers, Schelling, Carl Richter, Virchow, Helmholtz, Von Ranke, Mommsen, Harnack, Curtius, Brunner, Du Bois Raymond, and Koch.

The University is still lodged in Prince Henry's Palace, though it has outgrown its present quarters. It is supported by the state, under the Minister of Education. The immediate administration is in the hands of the rector and a senate composed of the full body of the professors. It is a self-governing body, and has police and judicial power over its members. A University court, made up of members of the faculty of law, exercises judicial power. This court may punish by reprimands, fines, imprisonment in the University prison, deprivation of credit, suspension, and expulsion. There is no dormitory system, as in American universities.

The University includes schools of Theology, Jurisprudence, Medicine, and Philosophy. Provision for technical education is made elsewhere. The degrees of doctor and licentiate are granted. The University has numerous institutes, clinics, seminars and other similar organizations, the seminar for oriental languages being especially important in training for foreign service. In 1922 the total enrollment of students was 12,724, of whom 1,484 were women. The University library contains over 330,000 volumes, besides the theses of applicants for degrees. In 1910 the University celebrated its one hundredth anniversary. Consult Lenz' *Geschichte der Friedrich-Wilhelms Universität* (4 vols., 1910).

Berlioz, bĕr'lē-ōs', Hector (1803–69), French musical composer, was born in Côte Saint André, near Grenoble. He studied at the Paris Conservatoire, and in 1830 was awarded the Prix de Rome. On returning to Paris in 1832, he became a journalist in order to support his family, meantime spending his spare time in musical composition. In 1841 he made the first of a series of European tours which established his reputation as a composer and conductor of the first rank. In 1856 he became an Academician and in 1859 was appointed librarian of the Conservatoire. Among his best known works are his symphonies, *La damnation de Faust* (1846), *Symphonie fantastique* (1828), *Romeo et Juliette* (1839), *Symphonie funèbre* (1840), and *Harold* (1834); a sacred trilogy, *L'Enfance du Christ* (1854); the operas, *Les Troyens* (1866), *Benvenuto Cellini* (1838), and *Beatrice et Bénédict* (1862); the overtures, *Le carnaval romain* (1840), *King Lear* (1831), and *Waverley* (1828); a requiem, *Messe des mortes* (1837), and a celebrated *Te Deum.*

Berlioz is comparable to Wagner in his supreme command of orchestration. He especially excelled in novel, even bizarre, musical combinations and effects, sometimes obtained by the use of rare instruments. He belonged to the romantic school, and was an advocate and exponent of 'programme music.' Besides a *Traité d'instrumentation* (German translation, with additions, by Richard Strauss, 1906), he wrote several books of witty and forceful comment on music and musicians, including *Voyage musicale en Allemagne* (1844), *Soirées de l'orchestre* (1852), and *Les grotesques de la musique* (1859). His *Mémoires* have been translated into English. Consult, also, Dunstan's *Life and Letters;* Mason's *Romantic Composers;* Hadow's *Studies in Modern Music* (first series).

Bermejo, ber-mä'hō, Rio, river, South America, rises in Bolivia, flows southeast through Northern Argentina, and enters the Paraguay River 35 miles from its confluence with the Parana. It is navigable for light craft over the greater part of its course. Total length, over 1,100 miles.

Bermondsey, a borough of London. See London.

Bermuda Grass, or Bahama Grass. See Cynodon.

Bermuda Hundred, ber-mū'da, a tract of land in Chesterfield county, Virginia, said to be the land granted in response to a petition (1639) from Bermuda, then over-populated. It played a prominent part in the Civil War. After an engagement at Drury's Bluff (May 16, 1864) with the Confederate forces under Beauregard, General Butler and the Army of the James, weakened by the withdrawal of two-thirds of their number to reinforce the Army of the Potomac under Grant, were shut up in Bermuda Hundred for the rest of the month, unable to risk a battle. Pop. of the district (1910), 2,554; (1920) 3,379.

Bermudas (discovered by the Spaniard Bermudez in 1515), or Somers Islands (so-called from Sir George Somers, who was wrecked here in 1609), a group of about 350 small coral islands belonging to Great Britain, in the Atlantic Ocean, between the parallels of 32° and 33° n. lat., 575 nautical miles from Cape Hatteras, the nearest land. Twenty of the islands are inhabited; but most of the land area (19½ square miles) is contained in the five islands of Hamilton or Bermuda (13 miles long), St. George, St. David, Somerset, and Ireland. The highest point is Sear's Hill (260 ft.). The climate is temperate and healthful, and the islands are a popular winter resort for Americans. Numerous picturesque and beautiful caves, several of which are lighted by acetylene gas, are an interesting sight. There are about one hundred miles of excellent roads, but no railroads. A causeway, running the length of the chief islands, was completed in 1871, at a cost of $160,000. Water is supplied by collecting rain water in cisterns, there being only three or four wells on the islands. The inhabitants, about two-thirds of whom are colored, are chiefly occupied in growing potatoes, onions, arrowroot, and lily bulbs. The chief town is Hamilton—pop. (1921) 2,578—which is connected with Halifax and Jamaica by telegraph. Ireland is a naval station, and has a dockyard and victualling yard. In 1902 one of the largest floating docks in the world was fixed here.

Trade is carried on chiefly with the United States, Great Britain, Canada, and the West Indies; exports amounted in 1921 to £224,626; imports to £1,340,240. Exports to the United States reached $1,164,713; imports from the United States, $4,237,079. The port of Hamilton was entered in 1921 by sailing and steam vessels totalling 2,387,797 tons.

The colony is administered by a governor appointed by the Crown, assisted by an executive council (6), a legislative council (9), and a house of assembly (36). The Bermudas were colonized by the British in 1612. They were much resorted to by Confederate blockade runners during the American Civil War. In September, 1922, a hurricane caused considerable damage to hotels and other buildings in Hamilton. Pop. (1921) 20,127, of whom 7,006 were white. Consult Ober's *Guide to the West Indies and Bermuda;* Hayward's *Bermuda Past and Present* (1910).

Bern, Switzerland. See Berne.

Bernadotte, bûr'na-dot, French general who in 1810 became king of Sweden, and founded the dynasty now reigning in that country. See Charles xiv. of Sweden.

Bernard, bûr'närd *or* bër-närd'; *Fr. pron.* ber-när', Claude (1813–78), French physiologist, was born in St. Julien, near Villefranche. He studied medicine at Paris; was appointed to the chair of general physiology there in 1854, and in 1855 became professor of experimental physiology in the Collège de France. He was elected to the French Academy (1869), and became president of the Academy of Sciences and of the Biological Society (1867–78). On his death his obsequies were conducted at public expense, and his eulogy was pronounced by Renan.

As an original investigator, Bernard stands among the foremost of the century. His earliest researches were devoted to the physiological action of the various secretions of the alimentary canal. His proof that the sole use of the pancreatic juice in the digestive system is so to modify the ingested fats as to render them capable of being absorbed by the chyle ducts, is a masterpiece of biological demonstration. Another important discovery established the saccharine function of the liver. Still more important was his demonstration of the connection between this function of the liver and the nervous system. For these discoveries he received the physiological prizes of the French Academy in 1851 and in 1853. Later researches were on the change of temperature of the blood in its passage from one organ to another; on the absorption of oxygen by the blood, and the respective amount of it in arterial and venous blood; on the comparative properties of the opium alkaloids; on the sympathetic nerves in general; as well as numerous investigations on the individual processes in the act of digestion.

Among his works are *Lessons in Experimental Physiology Applied to Medicine* (1865); *Lessons in Experimental Pathology* (1871); *Lessons on Anæsthetics and Asphyxia* (1875); *Lessons on the Life Common to Animals and Vegetables* (1879).

Bernard, Sir Francis (*c.* 1711–79), English colonial administrator in America, was born in Nettleham, England. He was graduated from Oxford in 1736; practised law in London; was governor of New Jersey (1758–60), and of Massachusetts (1760–9) during a period marked by an acrimonious conflict between the colonists and the British government, especially over the Stamp Act of 1765. Bernard, as the Royal representative, opposed the claims of the colonists, becoming extremely unpopular in Massachusetts, but winning approval at home.

Bernard, MOUNTAGUE (1820–82), English lawyer and jurist, was born in Gloucestershire. He was educated at Oxford, where he was appointed the first professor of international law in 1859. He visited the United States in 1871, in connection with the treaty of Washington; and Geneva in 1872, on the question of the *Alabama* arbitration.

Bernard, WILLIAM BAYLE (1807–75), Anglo-American dramatist, was born in Boston, Mass., the son of British parents. He was taken to England by his father, and received his education there, filling a government position until his dramatic work won success. After 1830 he rapidly produced plays and farces—over one hundred in all. The best known are *Rip Van Winkle* (1832); *The Nervous Man* (1833); *Man about Town* (1836); *His Last Legs* (1839). He edited *Retrospections of the Stage* (1830), from his father's papers, and in 1874 published a biography of Samuel Lover.

Bernard (Great Saint) Pass, the easiest pass over the Pennine Alps (8,111 feet), leads from Martigny (in the Swiss canton of Valais) to the Italian valley of Aosta, above Ivrea. It was known to the Romans as 'Alpis Pœnina,' and as 'Mons Jovis' (Montjoux) because of the temple of Jupiter on the summit. A hospice was established there as early as the ninth century, and was refounded in the eleventh century by St. Bernard of Menthon, archdeacon of Aosta (not to be confounded with St. Bernard of Clairvaux), whence its name. Since the twelfth century the hospice has been served by Austin Canons Regular, who extend hospitality to travellers, and with the help of the dogs that are called by St. Bernard's name, succor those who have succumbed to cold and fatigue. It has been crossed many times but perhaps the most famous passage was when Napoleon led his army across in May, 1800. The construction of railways has greatly diminished the importance of the pass. A carriage road to the summit was completed on the Swiss side in 1893, and on the Italian side in 1905.

Bernardin de Saint-Pierre. See SAINT-PIERRE.

Bernard (Little Saint) Pass (7,179 feet), leads from the French valley of the Upper Isère (or Tarentaise) to the Italian valley of Aosta, and is traversed by a carriage road completed about 1870. It was known to the Romans as 'Alpis Graia' (as it was the chief pass over the Graian Alps), and later as 'Mons Joveti' or Montjouvet (from an old temple of Jupiter, the name being the diminutive to distinguish the pass from its neighbor, the Great St. Bernard).

Bernard of Morlaix, also known as BERNARD OF CLUNY, French Benedictine monk of the twelfth century, author of a dactylic poem, *De Contemptu Mundi,* in three books, each of 1,000 verses. Published in 1483 at Paris, it is well known through Neale's translation, which contains the beautiful hymns, 'Jerusalem the Golden,' 'The World is Very Evil,' 'For Thee, O Dear, Dear Country.' The first known complete translation of the *De Contemptu Mundi* appeared in the *American Journal of Theology* (vol. x., 1906).

Bernard, St., of Clairvaux (1091–1153), a notable theologian of the Middle Ages, came of a noble Burgundian family. After two years spent in the Cistercian monastery of Citeaux, in 1115 he became first abbot of the newly founded monastery of Clairvaux, in Champagne. Bernard's saintly life and eloquence gave him an unexampled influence in Christendom, and he founded no fewer than seventy monasteries. Men of all ranks were drawn to him, and he became known as 'the Mellifluous Doctor.' In 1128 he drew up, by request, the statutes of the Knights Templar, and it was owing to him that Innocent II. was recognized by the sovereigns of Europe. He was largely instrumental in securing the condemnation of Abélard at the Council of Sens (1140). Pope Eugenius III. was his disciple. At the Council of Vezelay (1146) he moved the enthusiasm of France for the second crusade; and thousands of religious enthusiasts, fired by his eloquence, took up arms against the infidel. He prophesied great success for the venture and was so disheartened by its failure that his last years were clouded by sorrow. Bernard was canonized in 1173.

The reformed Cistercians, an order instituted by him, are often called Bernardines. His writings, which comprise letters, sermons, and hymns, hold high rank in the literature of mysticism. Many of his noble hymns (*e.g.*, 'Jesus, the Very Thought of Thee,' and 'O Sacred Head, Now Wounded') have been translated. Mabillon printed his works at Paris in 1690.

Bernardsville, borough, New Jersey, in Somerset County, on the Lackawanna Railroad; 21 miles southwest of Newark. It is a fashionable summer resort, and has a healthful climate and picturesque scenery. Pop. (1910) 4,608; (1920) 4,243.

Bernauer, ber'nou-*e*r, AGNES, a beautiful German girl, born in Augsburg, of plebeian descent. In 1432 she was secretly married to Albert of Bavaria, the only son of Ernest, Duke of Bavaria. Thereupon she was imprisoned by order of the duke, condemned as a witch, and drowned in the Danube, near Straubing, on Oct. 12, 1435. This tragic story furnished a fruitful theme for German dramatists and novelists.

Bernay' (ancient *Bernacum*), town, France, in the department of Eure, in the valley of Charentonne; 26 miles west of Evreux. It is an important industrial place, and has a mineral spring. The chief industries are cotton spinning and weaving. There is also a market for horses, cattle, and corn. Pop. 7,500.

Bernays, bûr'nīs, AUGUSTUS CHARLES (1854–1907), American surgeon, was born in Highland, Ill. He was graduated (1872) from McKendree College, took his degree in medicine at Heidelberg, and visited European hospitals. He settled in practice at St. Louis (1878), was appointed professor of anatomy at the St. Louis College of Physicians and Surgeons (1883) and later served in the Woman's Medical College. He made numerous improvements in the methods of operative surgery, and was a pioneer in antiseptic surgery in the United States. His works include *Chips from a Surgeon's Workshop,* surgical papers (1880–6), and several medical monographs.

Bernburg, bern'bo͝or*ch*, town, Germany, in the Free State of Anhalt, on both banks of the Saale River, 44 miles by rail south of Magdeburg. It has a Gothic church and a ruined château dating partly from the fourteenth century. There are iron works, and manufactures of machinery, sugar, paper and pottery. In the vicinity are the saline springs of Leopoldshall. Pop. (1925) 34,305.

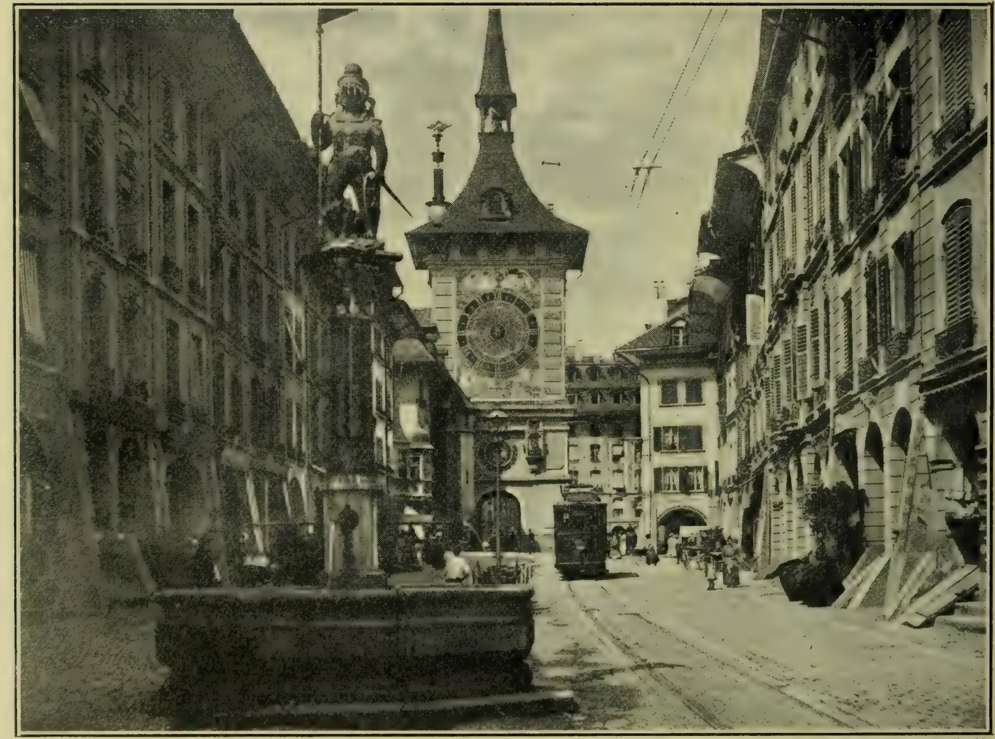
Berne (Bern), the most populous of the Swiss cantons, and the second in size, stretching northwest toward the German and French frontiers. The central portion is formed by the valley of the Aar, from its source to Büren, northwest of Berne; area 2,657 square miles (2,172 being productive). Of the 485 unproductive square miles, 111 are occupied by glaciers. The Jura Mountains are found in the northeastern part, while the Alps cross the southern portion. The population is German-speaking and Protestant, except in the Bernese Jura, where it is French and Roman Catholic.

The leading industries are

cattle raising, dairying and the manufacture of clocks, apparel, boots and shoes, cheese, and condensed milk. Sixty per cent. of the entire Swiss clock output comes from this canton. Fruit and cattle are exported. Pop. (1920) 674,394.

Berne, city, Switzerland, capital of Berne canton, and (since 1848) of the Swiss Confederation. It is finely situated on a high bluff, washed on all sides but one by the Aar, flowing in a deep valley below, and commands a superb view of the snowy Bernese Oberland Alps. Lofty bridges span the river and connect the old and new parts of the city. It ranks as the fourth town in Switzerland, coming after Zürich, Basel, and Geneva. The name seems really to be derived from 'bear,' and live bears have for centuries been kept in a pit outside the town. The chief mediæval buildings are the fifteenth-century Münster or Collegiate Church (wrongly called a cathedral, as there never has been a bishop of Berne), the fifteenth-century Town Hall, and some quaint watch towers in the main street which is adorned with delightful arcades, fountains and a famous clock tower. The principal modern buildings are the Federal Houses of Parliament, the Historical Museum, and the National Library. The University, founded in 1834, in 1926–7 had 1,384 students.

Berne is the seat of several international bureaus, as International Telegraphic Union (opened Jan. 1, 1869); the International Postal Union (formed as the result of the postal congress held at Berne on Sept. 15, 1874); the International Bureau for the Protection of Artistic and Literary Property (formed Jan. 1, 1888); and the International Transport (opened Jan. 1, 1893). The industries include the manufacture of clothing, boots and shoes, and chocolate. A national bank established in 1907, with headquarters divided between Berne and Zürich, has the exclusive right to issue bank notes. Berne was founded in 1191 by Berthold v., Duke of Zahringen. Pop. (1925) 107,960.



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Berne, Switzerland

The West Gate of the Old Town and the Zahringen Fountain in the foreground.

Berne, commune in the republic of Oldenburg, Germany, near the Weser, 9 miles northeast of Oldenburg. It was formerly the capital of the Stedinger Land. Pop. 4,000.

Berne Convention. See COPYRIGHT.

Berners, bûr′nerz, or BARNES, DAME JULIANA (flourished in the first half of the fifteenth century), by tradition, daughter of Sir James Berners of Berners Roding, Essex, and prioress of Sopwell nunnery, near St. Albans. Of the treatises ascribed to her—*Hawkynge, Huntynge, Fysshynge, Lynage of Coote Armiris, Blasyng of Armys* (all of which, except *Fysshynge*, appeared in the *Boke of St. Albans* in 1486)—probably only that on *Huntynge* and a part of that on *Fysshynge* were written by her. A facsimile of the treatise on *Fysshynge* appeared in 1880, and of the *Boke of St. Albans* in 1881.

Bernese Oberland Alps, a chain of the Alps rising to the north of the main chain, from which they are separated by the upper portion of the Rhône valley. In the narrower sense the Bernese Oberland Alps extend from the Grimsel Pass, on the northeast, to the Gemmi Pass, on the southwest. But the term is also used, in a wider sense, to comprise, on the northeast, the district between the Grimsel Pass and the Lake of Lucerne and Upper Reuss valley, thus including the Dammastock or Rhône Glacier region (11,920 feet), the Titlis group (10,627 feet), and the Uri Rothstock group (9,620 feet); while to the southwest of the Gemmi Pass the Oberland range is held to extend through the Wildstrubel (10,673 feet) and the Wildhorn (10,709 feet) to the Diablerets (10,650 feet).

The most popular tourist resorts are Thun, Interlaken, Meiringen, Lauterbrunnen, Mürrun, Grindelwald, and Kandersteg. The principal summits are the Finsteraarhorn (14,026 feet), Aletschhorn (13,721 feet), Jungfrau (13,669 feet), Gross Schreckhorn (13,386 feet), Gross Viescherhorn (13,285 feet), Eiger (13,042 feet), Bietschhorn (12,970 feet), and Wetterhorn (12,166 feet). Among the more important passes may be mentioned the Lauithor (12,140 feet), Mönchjoch (11,680 feet), Jungfraujoch (11,385 feet), Strahlegg (10,995 feet), and Petersgrat (10,516 feet). See Alps.

Bern'hard, Duke of Saxe-Weimar (1604–39), a Protestant general in the Thirty Years' War, son of John, third Duke of Saxe-Weimar. He entered the army of Christian iv. of Denmark (1625), and in 1630 joined Gustavus Adolphus. In the famous storming of Wallenstein's entrenched camp at Nuremberg (1632) he played an honorable part, and in the following year was created Duke of Franconia by the Swedish crown. On the fall of Gustavus, at the battle of Lützen (1632), he took the command, completed the victory, and drove the Imperialists out of Saxony. In the following year he captured the strong imperialist city of Regensburg (Ratisbon)—an exploit which was, however, neutralized by his defeat at Nördlingen by Gallas (1634). Then, refusing to accede to the Peace of Prague (1635), and making an agreement with Richelieu, he defeated the Imperialists at Rheinfelden (1638), and finished up the campaign by the capture of the strong fortress of Breisach. Death put an end to his plan of making Breisach the centre of an independent principality.

Bernhardt, bern'härt, Sarah (christened Rosine Bernard), (1845–1923), French actress, was born in Paris, on Oct. 23, 1845. Her parents were Dutch, her mother being of the Jewish religion and her father Catholic. Entering the Paris Conservatoire in 1860, she made her *début* at the Théâtre Français in 1862 in Iphigénie, when she received favorable notice from the critic Francisque Sarcey. But her impetuous disposition led to trouble with a senior member of the company, and she was forced to leave the Français. In 1867 she secured an engagement at the Odéon, and made her first hit there, in 1869, as Zanetto, in Coppée's *Le Passant.* In 1872, as the Queen in *Ruy Blas,* she gained great success, and was warmly praised by Victor Hugo. Returning to the Français, she played in *Mademoiselle de Belle-Isle,* and as Phèdre, in 1874, was recognized as the successor of Rachel. Two other great successes of this period were Doña Sol in Victor Hugo's *Hernani,* and in *La dame aux camélias* by Dumas the Younger.

In 1881 Bernhardt visited the United States, appearing in *Adrienne Lecouvreur, La dame aux camélias,* and other plays; and the next nine years were a triumphal progress around the world. In 1882 she married M. Damala, a member of her company, but soon left him. She was seen in New York in 1887 and again in 1891. Her great parts, such as Fédora, Théodora, La Tosca, etc., were designed to exhibit one personality. Her appearance as Jeanne d'Arc at the Porte St. Martin (1890) marked the beginning of her career as a manager in Paris. Jean Coquelin *aîné* now joined her company, and appeared with her in *L'Amphitryon* and in Sudermann's *Magda.* Her *Hamlet* (1899) was received with unanimous applause—the Danish prince was for the first time made intelligible to a French audience; and her impersonation of the title *rôle* in Rostand's *L'Aiglon* (1900) was a marvel of dramatic power. In 1900 she brought *L'Aiglon* to America, and in 1905, 1910, 1913 and 1916 was again in the United States, where she appeared in *La Tosca, Fédora, Jeanne d'Arc,* and other plays.

Mme. Bernhardt long retained her extraordinary vitality, her unique grace, and her wonderful voice. She engaged in painting and sculpture, and directed (after 1892) the Théâtre Sarah Bernhardt. She was a professor at the Conservatoire, and an officer of the Academy. Consult her own *Memories of My Life* (1907); Huret's *Biography* (Eng. trans.).

Berni, ber'nē, Francesco (1497–1536), Italian poet, was born in Lamporecchio. He travelled for some time with Ghiberti, whose secretary he had been, and in 1530 settled in Florence, where he gained the favor of the Medicis. His poems, mainly comic and burlesque, are unsurpassed for their wit, lightness, and elegance of form, notably his *Rime Burlesche* (1538). He recast in the same spirit Boiardo's epic, under the title of *Orlando Innamorato* (1541), which ranks next to Ariosto's *Orlando Furioso.*

Bernicia, ber-nish'i-*a*, an Anglican kingdom founded by Ida (547–559) during the period (500–580) when the Angles conquered the northeast of England. The kingdom extended from the Tees to Grangemouth, and divided with Strathclyde the whole south of Scotland. It was ultimately united to Deira under Ethelric, and in the 7th century with it became Northumbria. See Northumbria.

Bernina Alps. See Rhætian Alps.

Berni'na Pass (7,645 feet), a mountain pass leading from Sâmaden, the capital of the Upper Engadine (Switzerland), to the Italian Valtellina (valley of the Adda) at Tirano. It is now traversed by a carriage road, and has a hospice on the summit.

Bernini, ber-nē'nē, Giovanni Lorenzo (1598–1680), Italian architect and sculptor in the baroque style, was born in Naples. He was carefully trained by his father and studied the treasures of the Vatican. He enjoyed the patronage of Urban viii. for whom he designed a palace, as well as the great colonnade of St. Peter's, the colonnade enclosing the courtyard of the Vatican, and numerous fountains in Rome. Under Urban vii., and Clement x., he was superintendent of the building of St. Peter's and director of public works in Rome and was the recipient of the highest honor and appreciation. Among other well known works are *David, Apollo and Daphne, The Rape of Proserpine,* and *Sante Bibbiano.*

Bernoulli, ber-nōō'yē, family of mathematicians, refugees from Antwerp and Alva, settled at Frankfort (1583), and afterward at Basel, where all but Daniel were born.

James (1654–1705), versifier in Latin, French, and German, self-taught in geometry, published tables on dialling, a system of teaching mathematics to the blind, a treatise on comets (1680); visited England, where he knew Boyle; discussed the weight of the air (1683); and was professor of mathematics at the University of Basel (1687). From a hint of Leibniz he developed and made his own the differential calculus; solved the problem of the logarithmic spiral (1690)—'*Eadem mutata resurgo*' and the spiral were graven on his tombstone—of the isochronous curve, catenary, and of isoperimetrical figures (1696), as to which he quarrelled with his brother John; applied the calculus of probabilities to life and its accidents; and in his *Ars Conjectandi* (1713) prepared the way for Lagrange's calculus of variations. His collected works were published at Geneva (1744). German translations of his works may be found in Ostwald's *Klassiker der Exakten Wissenschaften* (vol. CLXXI., 1909, and vol. CLXXV., 1910).

John (1667–1748), brother of James, was professor of mathematics at Groningen (ten years), and his brother's successor at Basel. He was a rival of Newton and Leibniz, and excelled in differential, integral, and especially exponential calculus. He sided with Descartes, as James did with Newton. He wrote on navigation, the planets, and the laws of motion.

Daniel (1700–82), was born in Groningen, 'son of John Bernoulli' (his signature and pride). He published *Exercitationes Mathematicæ* (1724); was a professor of mathematics at St. Petersburg (1725–32); wrote his treatise, *Hydrodynamica* (1738), the first on the subject, in which he advocated the Bernoulli system of propulsion for ships; was professor, at different times, of anatomy, physics, botany, and filled the chair of natural and of speculative philosophy at Basel.

Not so distinguished, but men of mark, were Nicholas (1687–1759), professor of mathematics at Padua; John (1710–90), wrote on capstan, magnet, light; John (1744–1807), astronomer royal of Berlin at nineteen; Jerome (1745–1829), naturalist; James (1759–89), professor of physics at Basel, died in St. Petersburg; Christopher (1782–1863), professor of natural history at Basel.

Bernstein, bern-shtīn, Eduard (1850–), German political writer and Social Democratic leader, was born in Berlin. After spending twelve years in the banking business (1866–78), he turned his attention to writing, and became a contributor to and editor of several socialistic publications. He lived in Switzerland (1878–88) and in London (1888–1901). On his return to Germany he was elected to the Imperial Reichstag, and served from 1902 to 1906 and again in 1912. In 1919 he allied himself with the Majority Socialists. He published *Gesellschaftliches und Privateigentum* (1891); *Zur Geschichte und Theorie des Sozialismus* (1900); *Die Geschichte der Berliner Arbeiterbewegung* (3 vols., 1907–10); *Die Arbeiterbewegung* (1910). *Erinnerungen eines Sozialisten* (1918); *Die deutsche Revolution, ihre Enstehung, ihre Verlauf und ihr Werk* (1921). His book, *Die Voraussetzungen des Sozialismus und die Aufgaben der Sozialdemokratie* (1899; Eng. trans., under the title *Evolutionary Socialism*, 1909), in which he advocated a more opportunist policy, gave rise to keen discussion in the German Socialist party.

Bernstorff, bern′stôrf, Albrecht, Count von (1809–73), German diplomat, was born in Dreylützow, Mecklenburg. He studied in Göttingen and Berlin, and started his diplomatic career as Prussian *attaché* at Hamburg. After filling numerous diplomatic posts, he served as Prussian ambassador to St. James (with the exception of a short but notable period as minister of foreign affairs, 1861–2) from 1854 until his death.

Bernstorff, Andreas Peter, Count (1735–97), Danish statesman, was born in Hanover, Germany. As minister of foreign affairs (1773) he concluded a defensive alliance with Russia directed against Sweden. In 1780 he was induced by Russia to join the armed neutrality compact; but an agreement with Britain five days previously, fixing the meaning of the phrase 'contraband,' was taken so ill by Russia that he was forced to resign. He returned to power in 1784, and during the revolutionary wars rigorously observed the non-intervention principle.

Bernstorff, Johann Hartwig Ernst, Count (1712–72), Danish statesman, son of the Hanoverian baron and minister, Joachim von Bernstorff, was born in Hanover. From 1733 to 1744 he was in the Danish diplomatic service, but was recalled in 1751 to succeed Schubin as minister of foreign affairs, a position he held for the next nineteen years, during which period he earned the reputation of being one of the greatest of European statesmen. A war with Russia in 1762 was happily averted by the dethronement of Czar Peter III., and Bernstorff succeeded in satisfactorily adjusting the long-outstanding Gottorp difficulty, whereby Denmark surrendered Oldenburg and Delmenhorst in exchange for Schleswig. Bernstorff, regarding Russian support as a necessary counterpoise to the hostile Franco-Swedish league, was successful in subsequently forming an alliance with Russia. He was styled by Frederick the Great the 'Oracle of Denmark.'

Bernstorff, Count Johann Heinrich von (1862–), German diplomat, was born in London, where his father, Albrecht (q.v.), was ambassador. He was educated at Ratzeburg and Dresden, and entered the army in 1881. In 1887 he married Miss Jeanne Luckmeyer, of New York. He became *attaché* at Constantinople in 1889, and was secretary of legation successively at Belgrade, Dresden, St. Petersburg (Leningrad), and Munich. From 1902 to 1906 he was councillor and secretary to the German embassy at London; in 1906 consul-general, and in 1908 minister plenipotentiary, at Cairo, Egypt. In 1908 he became German ambassador to the United States, a post he retained until the United States' entrance into the Great War, when he returned to Germany. He was ambassador to Constantinople, 1917–18. He became a member of the Democratic party in the Reichstag after the revolution and was chairman of the German League of Nations Union.

Berœa, ber-ē′*a*, (now Verria), an ancient town in Macedonia, southwest of Pella, and about 20 miles from the sea. It was unsuccessfully besieged by the Athenians (432 B.C.), but occupied by the Romans (168 B.C.).

Berœa, the modern Aleppo, a town in Syria, near Antioch, enlarged by Seleucus Nicator, who gave it the name of Berœa.

Berœans, or Bereans, a religious sect in Scotland, founded in 1773 by John Barclay (q.v.).

Berosus, ber-ō′sus, (*c.* 330–250 B.C.), a priest of Belus at Babylon, who wrote a history of Babylon in the Greek language. Though it is lost, Josephus, Eusebius, and the Christian fathers have preserved a number of fragments.

Berre, Etang de, salt-water lagoon (60 square miles), in the department Bouches-du-Rhône, France, connected with the Mediterranean by the Canal de Bouc (3 miles long). It has a fishing industry, salt-pans, and factories for chemical products, and its shores are lined with olive groves and orchards.

Berri (Berry), Charles Ferdinand, Duc de (1778–1820), younger son of Charles X., was born in Versailles. He fled (1789) to Italy at the Revolution; served with Condé against France, and later was in the Russian service. In 1801 he went to England, where he married an English lady, whom he abandoned on his return to France in 1814. He married Marie, Duchess of Naples in 1816, and in 1820 was assassinated at the opera.

Berruguete, ber-rōō-gā′tā, Alonzo (*c.* 1480–1561), Spanish sculptor, painter, and architect, was born in Parades de Nava, near Valladolid. He studied in Florence (1503) under Michelangelo, whom he accompanied to Rome in 1505. Returning to Spain (1520), he was appointed royal sculptor and painter to Charles V. He was the architect of Charles' unfinished palace at Granada, and also of the palace of the archbishop of Toledo at Alcala. His sculptures are numerous, and include his masterpiece, the archbishop's stall in the cathedral of Toledo, representing *The Transfiguration*, worked in marble, and the tomb of Cardinal Tavera in St. John's, Toledo. Berruguete introduced the Italian *cinquecento* style into Spain. He died in Toledo.

Berry. See FRUIT.

Berry, MARTHA MCCHESNEY (1866–), American educator and philanthropist, was born near Rome, Ga. She was educated at the Edgeworth School, Baltimore, and in 1902 started, on her own farm in Mount Berry, Ga., a school for a few poor children from the remote mountain districts, which subsequently developed into the Martha Berry Schools, training from 600 to 700 boys and girls annually. In recognition of her work, Miss Berry was in 1925 awarded the Roosevelt Medal for Distinguished Service in promoting the welfare of women and children.

Berry, MARY (1763–1852), English author, was born in Yorkshire. In the winter of 1788 she and her sister Agnes, fourteen months her junior, met Horace Walpole, then almost seventy years of age, and a close friendship developed. Walpole established the sisters at Little Strawberry Hill, and bequeathed to them the house and garden there, his manuscripts, and £4,000 each. Mary Berry published an edition of *The Works of Horace Walpole* (1798) and *England and France: a comparative View of the Social Condition of both Countries* (1844). Consult her *Journals and Correspondence.*

Berryer, ber-ē-ā', PIERRE ANTOINE (1790–1868), French lawyer and politician, was born in Paris. He aided his father, Pierre Nicholas Berryer (1757–1841), in the defence of Marshal Ney, and also defended Lamennais (1826), Chateaubriand (1833), Prince Louis Napoleon (1840), and Montalembert (1858). From 1829 to 1852 he was uninterruptedly a deputy, and one of the leaders of the Legitimist party. In 1854 he was elected a member of the Academy. Berryer was a great and eloquent speaker, with a brilliant imagination and high intelligence. Although a fervent royalist and Catholic, he held liberal views. His works were published under the titles *Discours parlementaires* (5 vols. 1872–4) and *Plaidoyers* (4 vols. 1875–8).

Bersaglieri, bâr-sä-lyer'ē (It. 'marksmen'), a corps of sharpshooters of the Italian army, conspicuous by their felt hats, which bear the distinctive badge of a plume of cock feathers. They were organized in 1850, and became prominent during the long struggle for Italian unity. They number more than 100,000, but more than half of these are in the reserve.

Berseem, or EGYPTIAN CLOVER (*Trifolium alexandrium*), a species of Trifolium allied to the ordinary red clover. It is a leguminous annual growing from two to five feet in height, with rather small whitish flower heads. It is the principal green fodder plant of Lower Egypt and has been successfully grown in the Southwestern United States.

Berseem, or Egyptian Clover
1. Single flower

Ber'serks, or BERSERKERS, the name given to Norse warriors who figure in the ancient sagas, probably because they fought in their *serks* ('shirts') without mail. They were subject to savage, animal-like frenzies, in which they bit their shields, bellowed and howled, and rushed like mad dogs among their foes, striking terrible blows with their weapons. The Berserks are also described as 'shape-changers,' taking on the shape as well as the ferocity of brutes, a fact which connects them with werewolves.

Bert, bâr, PAUL (1833–86), French physician, was born in Auxerre. He studied law and medicine, becoming professor of natural sciences at Bordeaux (1866), and afterward professor of physiology at Paris (1869). He was appointed prefect of the north in 1870, and minister of public instruction in the Gambetta ministry in 1881. He carried on important research work in physiology, especially in skin grafting, respiration, and the action of anæsthetics.

Bertha, BERCTA, or ADILBERGA, the name of several famous women, real and legendary. Among them are the following:

St. Bertha (d. before 616), daughter of Charibert, king of the Franks, married Æthelbert, king of Kent (*c.* 560). On her marriage it was agreed that she should be permitted to profess Christianity, and the Church of St. Martin in Canterbury was set apart for her use. She was influential in spreading Christianity among the Anglo-Saxons.

Bertha, the daughter of Burkhard, duke of Alemannia, and wife of Rudolf II. (937), king of Upper Burgundy, acted as regent for her infant son Conrad.

Bertha, *alias* Agatha, was the betrothed of Hereward.

Bertha (d. 783), called 'Bertha with the big foot' (*au grand pied*), because one of her feet was larger than the other, was the daughter of Charibert, Count of Laon. She married Pepin the Short, and was mother of Charlemagne.

Berthelot, ber-t'lō', PIERRE EUGÈNE MARCELLIN (1827–1907), French chemist and statesman, was born in Paris. He was educated at the Collège Henri IV., and was appointed professor in the School of Pharmacy (1860), and in the Collège de France (1865). He was inspector-general of higher education (1876); became a life-member of the Senate (1881); and was minister of education (1886–7) and of foreign affairs (1895–6). His studies in the synthesis of organic substances were of great importance in the advance of science, as well as in the improvement of industrial processes. His publications include: *Traité elémentaire de chimie organique* (1872; 4th ed. 1898); *Sur la force de la poudre et des matières explosives* (1872; 3rd ed. 1883); *La synthèse chimique* (1875; 8th ed. 1897); *Traité pratique de calorimétrie chimique, fondée sur la thermo-chimie* (1879); *Thermochimie* (1897); *Les carbures d'hydrogène* (1901). He was author, also, of books on the alchemists (1885 and 1888), and on mediæval chemistry (1893).

Berthier, ber-tyā', LOUIS ALEXANDRE (1753–1815), French marshal, was born in Versailles. He began his military career as an officer of Louis XV., and fought under Lafayette in the American Revolution (1778–82). As chief of the general staff, he took a leading part in all Napoleon's great campaigns, and was created a marshal of France by Napoleon in 1804, Prince of Neuchâtel in 1806, and Prince of Wagram in 1809. He was Napoleon's proxy in his marriage to Marie Louise in 1810. After his leader's downfall he made peace with Louis XVIII., and upon Napoleon's return from Elba, retired to Bamberg, where he either committed suicide or was murdered. His *Mémoires* were published in 1827.

Berthold von Regensburg, ber′tolt fon rā′gens-bōōrch (*c.* 1220–72), a Franciscan friar, one of the most popular preachers of the Middle Ages in Germany, was probably born in Regensburg. He began his work as an itinerant preacher about 1250 and frequently officiated in Alsace, Switzerland, Austria, Hungary, Poland, and Italy. His sermons, generally of a missionary character, are written in a language abounding in graphic imagery and intense realism. Luxury he strenuously opposed, and did much to accelerate the decline of Middle High German poetry by his condemnation of the elegant world of chivalry. His *Sermons* (2 vols.) have been edited by Pfeiffer and Strobl.

Berthollet, ber-tō-lā′, Claude Louis, Count (1748–1822), French chemist, was born in Talloire, Savoy. He studied at Turin, and in 1794 received a professorship in Paris. He was sent in 1796 to Italy, to make a selection from the art treasures extorted by Napoleon, and in 1799 accompanied the latter to Egypt. He was elected to the Academy of Sciences in 1781. Berthollet was an ardent reformer of chemical nomenclature; he was the first to analyze ammonia, discovered chlorate of potash and fulminating silver, and studied the properties of chlorine. He also introduced and applied the principle of chemical equilibrium. He was created senator and count by Bonaparte, and was raised to the peerage by Louis xviii. His published works include monographs on chemical nomenclature (with Lavoisier, 1787), dyeing (1805), bleaching with chlorine (1795), the laws of chemical affinity (1801), and *Essai de statique chemique* (1803).

Bertholletia. See Brazil Nut.

Berthoud. See Burgdorf.

Bertillon, ber-tē-yôn′, Alphonse (1853–1914), French penologist, was born in Paris. He studied medicine with his father, a famous statistician and anthropologist, and was admitted to practice. In 1880 he perfected the famous system of criminal identification with which his name is associated, and in 1882 it was introduced into the Paris police system. He was also a handwriting expert and figured conspicuously in the Dreyfus case (q. v.).

Bertillon System, an anthropometric method devised by M. Alphonse Bertillon (q. v.) for the identification of criminals, based upon the fact that no two persons ever give exactly identical physical measurements. Certain measurements are taken from every convicted person, and recorded on cards, which can readily be located by an elaborate system of classification. The following are the measurements made: the length and width of the head; the length of the left foot, and of the middle and little fingers of the left hand; the stature of the whole body, as well as the length of its upper and lower portions; the span of the outstretched arms; the length and breadth of the right ear, and the length of the left forearm. The color of the iris of the eye, and the characteristic lines made by the print of the finger, are also recorded. The system has been introduced into the United States and has been adopted in the larger penal institutions. Consult Bertillon's *Identification of Criminals* (trans. by Gallus Muller).

Bertin, ber-taṅ′, Louis François (1766–1841), French journalist, called l'Ainé to distinguish him from a brother of the same name, was born in Paris. During the revolution he edited *L'Eclair* (which was suppressed in 1798 by the Directory), and in 1800 began to conduct the powerful *Journal des débats* (founded 1789). He was banished to Elba by Bonaparte in 1801, but resumed his work in Paris in 1804, under the title of *Journal de l'Empire.* After the restoration of the Bourbons, he resumed the editorship of the *Débats.*

Bertrand, ber-träṅ′, Henri Gratien, Count (1773–1844), French general, was born at Châteauroux. He served under Napoleon in Egypt, Austria, and Russia, distinguishing himself at Austerlitz, Grossbeeren, Leipzig, and Waterloo. He was created count and governor of Illyria (1809), and shared in Napoleon's banishment to St. Helena, remaining there until the Emperor's death. On his return to France he was made commandant of the Polytechnic School. His *Campagnes d'Egyptê et de Syrie, Mémoires pour servir a l'historie de Napoleon, dictes par lui-même à Sainte Hélène,* was published by his sons in 1847.

Bertran de Born (*c.* 1140–1215), Provençal troubadour, was born in the viscounty of Limoges (diocese of Périgueux). He was of noble family, and in 1169 joined the barons of Limoges, Poitou, and Périgord in their endeavors to throw off the yoke of Richard Cœur de Lion (1182–3). In the last years of his life he became a monk in the Cistercian abbey of Dalon, where he died. His poems, forty-five of which have come down to us, are mostly *sirventeses,* or satirical lays, in support of the barons and Henry of England, and against Richard Cœur de Lion and his ally. They are rough and often unpolished, but highly effective and picturesque, while his love songs are tender without being sentimental. The poems have been edited by Stimming (1879 and 1892) and by Thomas (1888). Consult Hueffer's *The Troubadours.*

Bervic, ber-vēk′, Charles Clément (1756–1822), French engraver, was born in Paris. He studied under J. G. Wille, and is best known by his portrait of Louis xvi., although his *chef-d'œuvre* is his engraving of the *Laocoön.* He was elected a member of the Academy in 1784 and received the Legion of Honor in 1819.

Berwick, bur′wik, borough, Pennsylvania, in Columbia county, on the north branch of the Susquehanna River, and on the Delaware, Lackawanna and Western and the Pennsylvania Railroads; 28 miles southwest of Wilkes-Barre. It has important car manufacturing interests, the first all-steel passenger coach having been produced here in 1904. Other industries are silk mills, wood working plants, and the manufacture of shirts and automobile accessories. Pop. (1910) 5,357; (1920) 12,181.

Berwick, ber′ik, James Fitz-James, Duke of (1670–1734), French marshal, was born in Moulins, France, the natural son of James ii. and Arabella Churchill, sister of the Duke of Marlborough. He was educated in France and entered the army, serving in Hungary under the Duke of Lorraine. In 1688 he went to England and in 1690 was wounded at the Battle of the Boyne. In 1706 he was created a marshal of France and sent into Spain, where, by the victory of Almanza (1707), he firmly seated Philip v. on the throne. In 1709 he conducted a skilful defensive campaign in Dauphiny, in 1714 he captured Barcelona, and in 1716 he was appointed commandant of Guienne. At the siege of Philipsburg in June, 1734, he was killed by a cannon-ball. His *Mémoires,* written by himself, were completed by Abbé Hosk and published in 1778.

Berwick-on-Tweed, seaport and market town, England, at the mouth of the Tweed; 60 miles southeast of Edinburgh. It is a border town and forms of itself an independent county of 8 square miles, although for election purposes it is considered a part of Northumberland. It is still surrounded by ramparts and contains many ancient buildings. A magnificent bridge of fifteen arches and a railway viaduct, designed by Robert Stephenson, connect it with Spittal and Tweedmouth. The chief industries are fishing, iron-founding, shipbuilding, and agricultural implement making. Authentic records of Berwick date back to the 12th century. It was involved in much of the Border warfare, the siege by the English in 1296 being especially memorable. It was by an Act of Parliament (1885) included in England. Pop. (1921) 12,994.

Ber'wickshire, a border county in the southeastern part of Scotland, with an area of 457 square miles. The land is in general low and flat toward the south, rising gradually in the north. The coast is bold and rocky, and the few harbors are much exposed. The chief mountain range is the Lammermuir; the highest peak, Seenes Law (1,683 ft.). The principal rivers are the Tweed—which forms the boundary for 21 miles—and its tributaries. Agriculture is the chief industry. Cattle raising is important, there are valuable fisheries, and sandstone is worked for building purposes. The manufactures include woollen, linen, leather, and paper. Duns is the county town; other large towns are Lauder, Eyemouth, and Coldstream. Pop. (1921) 28,395.

Berwyn, bûr'win, city, Illinois, Cook county, on the Chicago, Burlington and Quincy, and the Illinois Central Railroads; 7 miles west of Chicago, of which it is a residential suburb. Pop. (1910) 5,841, (1920) 14,150.

Beryl, ber'il, a silicate of aluminium and beryllium occurring in hexagonal prismatic crystals and in columnar and granular masses. The lustre of beryl is vitreous, and the color usually a light green blue or yellow. The bright green and pale blue or green transparent varieties are known respectively as emerald and aquamarine (qq. v.).

Beryllium, be-ril'i-um, (Be), also known as GLUCINUM (Gl; 9.1.), a rare metallic element occurring in beryl and other silicates. It is prepared from its chloride by displacement by sodium, and is steel-colored, hard, and crystalline. It is not easily oxydized directly, though it forms an oxide, BeO, with a sweetish taste.

Berzelius, ber-zē'li-us, JÖNS JAKOB, BARON (1779–1848), celebrated Swedish chemist, was born in Väfuersunda, East Gotland. He studied chemistry and medicine at Upsala, was graduated in 1804, and went to Stockholm, where he became successively assistant professor and professor (1806) of medicine and chemical pharmacy in the University. In 1810 he became president of the Royal Academy of Sciences at Stockholm and in 1818 Secretary. He was knighted in 1815 and made a baron in 1835. Berzelius' contributions to chemical knowledge are of the greatest importance; he discovered selenium, thorium, and cerium; isolated silicon and other elements; and investigated the compounds of fluorine. His chief work, however, was the determination of the combining proportions and atomic weights of the elements by an improved analytical method. He introduced a system of symbols which are the basis of those used to-day, and was a pioneer in organic chemistry. He wrote *Text-book of Chemistry* (3 vols. 1808–48), translated into various languages; also *Annual Reports on the Progress of Physics, Chemistry, and Mineralogy* (27 vols. 1821–48).

Bes, bās, an Egyptian god, probably of foreign origin. He is the god of art, of song and dance, and is represented as a grotesque figure, clad in a panther hide. He was worshipped also in Cyprus and Phœnicia.

Besançon, be-zäṅ-sôṅ', town, first-class fortress, and episcopal see, France, capital of the department of Doubs, is situated on a peninsula almost surrounded by the river Doubs, which forms a canal berween the Rhine and the Rhone; 60 miles southwest of Belfort. Noteworthy features are the citadel, the cathedral of St. Jean, a museum with a good collection of paintings and antiquities, the university, and the Porte de Mars, a triumphal arch erected in A. D. 167. Besançon is a flourishing industrial town, having manufactures of watches, silk, flour, and hardware. It is also an important railway centre.

Besançon was made a free town in the 12th century and was the meeting place of several diets. It is the birthplace of Cardinal Granville, Charles Nodier, and Victor Hugo. Pop. (1921) 55,652.

Besant, bez'ant, MRS. ANNIE, *nee* WOOD (1847–), English theosophist, was married in 1867 to the Rev. Frank Besant, vicar of Sibsey, Lincolnshire, from whom she legally separated in 1873. The following year she joined the National Secular Society. She co-operated with Charles Bradlaugh in the 'seventies and 'eighties in his freethought and radical movement, and was co-editor with him of the *National Reformer*. From 1887 to 1890 she was a member of the London School Board. In 1889 she became a disciple of the theosophist, Madame Blavatsky, and in 1907 she was elected president of the Theosophical Society. In 1898 Mrs. Besant founded the Central Hindu College at Benares, and in 1918 began work toward the founding of the University of India. She wrote numerous works on theosophy, and an autobiography, *Through Storm to Peace*, appeared in 1893.

Besant, SIR WALTER (1836–1901), English novelist and critic, was born in Portsmouth. He was educated at King's College, London, and at Cambridge, and from 1861 to 1867 was senior professor in the Royal College of Mauritius (the 'Palmiste Island' described in more than one of his novels). In consequence of ill-health he returned to England in 1868, and began to publish novels written in conjunction with his friend James Rice—*e. g. Ready-money Mortiboy* (1871), *The Golden Butterfly* (1876), *The Monks of Thelma* (1878), *The Chaplain of the Fleet* (1881), *The Seamy Side* (1881). Rice died in 1882, but Besant continued writing, his most successful novels being *All Sorts and Conditions of Men* (1882), *All in a Garden Fair* (1883), *Dorothy Forster* (1884), *The World Went Very Well Then* (1887), *Armorel of Lyonnesse* (1890), and *Beyond the Dreams of Avarice* (1894). His novel *All Sorts and Conditions of Men*, considered 'utopian' in theory, led to the erection of the People's Palace (1887) in the East End of London. In 1873 he wrote *The French Humorists, from the 12th to the 19th Century*. For a time he acted as secretary to the Palestine Exploration Fund, and, in conjunction with Professor E. H. Palmer, wrote a *History of Jerusalem* (4th ed. 1899). In 1883 he published a sympathetic memoir of Palmer. Other works include *Rabelais*, for the 'Ancient and Foreign Classic' Series; *Coligny; Whittington; The Eulogy of Richard Jefferies; Captain Cook*, in the 'English Men of Action' Series; and *The Story of King Alfred*. Besant's novels reveal an extensive knowledge of London life in its humble aspects, and are eminently readable from their excellent blending of humor and pathos.

Besika Bay, be-sē'kä, on the northwest coast of Asia Minor, opposite the island of Tenedos, south of the Dardanelles. It was a station of the British navy during the Crimean War, and again in 1877–8. It was shelled by the British in 1915.

Beskid, bes'kēd', or BIESKID MOUNTAINS, a range of the Carpathians, linking together the West Carpathians and the East Carpathians, and forming the frontier between Czechoslovakia and Poland. The principal peaks are Babia Gora (5,650 ft.), Smrk (4,400 ft.), and Lissa Hora (4,360 ft.). The range is crossed by the Jablunka Pass (1,970 ft.), through which runs the Budapest-Breslau Railway.

Beskow, bes'kov, BERNHARD VON, BARON (1796–1868), Swedish author, a determined opponent of the Swedish new romanticists. His best works are the dissertations and biographies (1860–6, 1870) published by the Academy, whose secretary he was from 1834 to his death—notably his noble and eloquent panegyric of Gustavus III., *Gustaf III. som Konungoch Människa*. His most meritorious poems were *Karl XII.* (1819) and *Sveriges Anor* (1824), and his best tragedy *Torkel Knutsson* (1830).

Besnard, bās'när' (Paul) Albert (1849–), French artist, was born in Paris. He studied at the Ecole des Beaux-Arts, under Cabanel, exhibited at the salon of 1868, and received the Prix de Rome in 1874. He decorated the vestibule of the School of Pharmacy, in Paris, the Hôtel de Ville, the Sorbonne, the Casino at Evian, the Théâtre Français, and the Peace Palace at the Hague. In 1911 Besnard made a trip to India, and some of his most notable paintings are of scenes from that country. His works, which are numerous, include *Portrait of Madame Roger Jourdin*, *The Artist's Family*, *Princess Mathilde*, *Weeping Woman*, *The Steps at Benares*, *Indian Dancing Girl*, and *Portrait of Madame Besnard*.

Bessarabia, bes-*a*-rā'bi-*a*, province, Roumania, lying between, the Black Sea and the Dniester, Pruth, and Danube Rivers, with an area of 17,146 square miles. The northern part is thickly wooded, with fertile valleys planted with vines, while to the south stretch the steppe lands with great sweeps of good pasturage and fields of corn and flax. The province is watered by the Dniester, the Pruth, and the Danube, and their tributaries. Agriculture is the chief industry, the famous 'black earth' bearing luxuriant crops. Cereals, all kinds of fruits, particularly grapes, and vegetables are produced in abundance, and the rivers abound in fish. Manufacturing is but little developed, but commerce is actively carried on. The capital is Chisinau (Russian Kichinev). Bessarabia became a Turkish possession in 1503. Russia annexed it in 1812, and in 1856 Moldavia annexed a small portion, which in 1878 was restored to Russia. Following the Great War the province was allotted to Roumania. Pop. (1919) 2,344,800.

Bessarion, bes-ā'ri-on, Johannes (1403–72), Greek cardinal, was born in Trebizond. He was made archbishop of Nicæa by John VII. (Palæologus) in 1437, accompanied him next year to the Council of Ferrara, and was created a cardinal by Pope Eugenius IV. in 1439. He died at Ravenna, on returning from an embassy to Louis XI. He was one of the small band who revived the study of Greek in Italy, and so initiated the humanistic movement in Europe. His works are collected in Migne's *Patrologia Græca*.

Bessel, bes'*e*l, Friedrich Wilhelm (1784–1846), Prussian astronomer, was born in Minden. In 1810 he was appointed director of the new Königsberg observatory, and professor of astronomy at Königsberg University. His most notable achievements were the discovery of the parallax of the fixed star 61 Cygni, and his great *Fundamenta Astronomiæ* (1818), a reduction of Bradley's Greenwich observations of fifty years before, with continuations in 1830 and 1841–2. In the field of astronomical mathematics he also distinguished himself. He embodied the results of many years of labor in *Astronomische Beobachtungen* (1815–44).

Bessels, bes'*e*ls, Emil (1847–88), German Arctic explorer, was born in Heidelberg, and studied natural science and medicine. In 1869 he undertook his first Arctic expedition to the eastern part of the sea between Spitzbergen and Novaya Zemlya and Gillis Land. In 1871 he was entrusted by the U. S. Government with the leadership of the scientific staff of the polar expedition under Charles Francis Hall. The expedition (1871–3), in the *Polaris*, reached lat. 82° 26'; but unfortunately the ship was wrecked, and all the collections were lost. Bessels wrote *Report on the Scientific Results of the 'Polaris' Expedition* (1876), and *Die Amerikanische Nordpolexpedition* (1878).

Bessemer, city, Alabama, Jefferson county, on the Illinois Central, the Southern, the Louisville and Nashville, the St. Louis-San Francisco, and other Railroads; 12 miles southwest of Birmingham. Industrial establishments include blast furnaces, foundries, structural steel works, rolling and planing mills, clay products plants and machine shops. There are iron and coal mines near the city. Pop. (1900) 6,358; (1910) 10,864; (1920) 18,674.

Bessemer, city, Michigan, county seat of Gogebic county, on the Duluth, South Shore and Atlantic, the Chicago and North Western, and the Minneapolis, St. Paul and Sault Ste. Marie Railroads; 100 miles southeast of Duluth, Minnesota. It is situated in the Gogebic iron range, with mining as the most important industry. Pop. (1910) 4,583; (1920) 5,482.

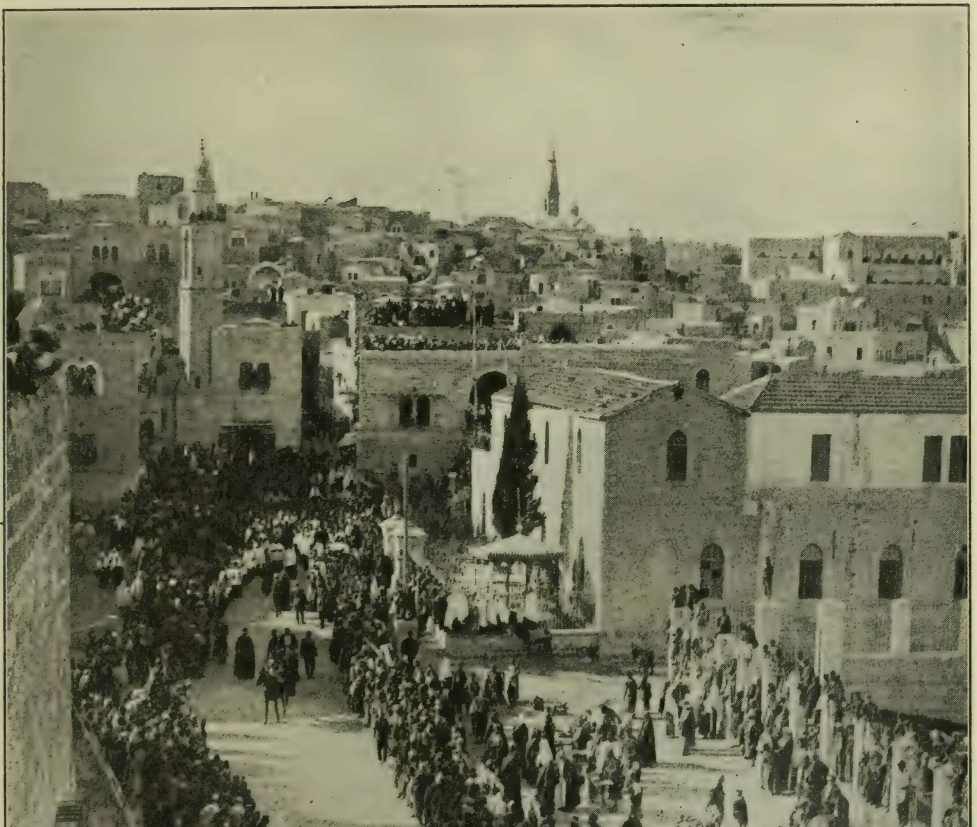
Bessemer, Sir Henry (1813–98), English metallurgist and inventor, was born in Charlton, Hertfordshire, and received his mechanical training in his father's type foundry. He is known chiefly for his process for the manufacture of steel, put forward in 1856, which revolutionized that industry throughout the world. He also patented inventions for die casting, railway signalling, and bronze painting. For preventing sea-sickness he invented a ship with an adjustible cabin which should always preserve a horizontal floor, but this device proved a failure. Bessemer was knighted in 1879.

Bessemer Process. See Steel.

Bessières, be-syâr', Jean Baptiste (1768–1813), Duke of Istria (1809) and marshal of France (1804), was born in Preissac (Lot), and served as a private soldier under Louis XVI. Attracting the attention of Napoleon, he became one of his most trusted lieutenants, and served brilliantly in Egypt and at Marengo, where his cavalry charge decided the day; and again at Austerlitz, Jena, Eylau, and in the Spanish and Russian campaigns. He was given the command of the cavalry of the grand army in 1813, and was killed at the battle of Lützen.

Best, William Thomas (1826–97), English organist, was born in Carlisle. He held his first appointment as organist when fourteen years of age, and subsequently filled important posts in Liverpool (1840), London (1852), and again in Liverpool (1854). Best did much to familiarize the public with the organ works of Bach, and besides making numerous arrangements for the instrument, published several important educational works on organ playing.

Bestiary, bes'ti-ā-ri, (Fr. *bestiaire*), a popular series of mediæval books, consisting of descriptions of animals which are afterward treated as allegorical types of the spiritual life. These bestiaries (or *physiologi*, as they were first called) were the product of the allegorizing tendencies of the early Christians applied to the natural history of the elder Pliny. The foundation of the class is the unpublished Greek *Physiologus*, which must date back before the 4th century, as Epiphanius refers to it in his controversy with Origen. The oldest translation into a European language is the 8th century Anglo-Saxon version of the *Panther*, the *Whale*, and the *Partridge*, found in the Exeter Book (edited for the Early English Text Society by Mr. Israel Gollancz). The Old High German version dates from before the 11th century. Philippe de Thaun produced in the 12th century his French *Livres des Créatures* and *Le Bestiaire* (printed in T. Wright's 'Popular Treatises on Science,' 1841). A middle English 13th cen-



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BETHLEHEM

The Catholic Archbishop arriving at the Church of the Nativity on Christmas Eve.

tury version will be found, along with the Latin text, of Bishop Theobald, in Morris' *An Old English Miscellany* (Early English Text Society, 1872). See also Wright's *Reliquiæ Antiquæ* (1841–3).

Bestuzhev, b*e*-stōō'zhev, Alexander Alexandrovitch (1797–1837), Russian writer, about whose early life little is known. He first achieved prominence as editor, with Ryleyev, in 1822, of the *Polar Star*, the first Russian literary annual, modeled after the German *Almanache*. This ceased publication after its second year and in 1825 Bestuzhev, being implicated in a conspiracy in St. Petersburg, was deprived of his commission in the guards and exiled to Siberia. He was later transferred to a regiment stationed on the Persian frontier and soon resumed his literary work, writing under the name of Marlinsky. His work of this period consists chiefly of romantic tales and sketches of a military character, of which *Amalet Bek* is probably the best. His collected works were published in St. Petersburg (1st ed. 1835), under the title *Marlinsky's Tales*.

Besuki, bā-zōō'kē (Dutch *Besoeki*), residency of Java, Dutch East Indies, the easternmost in the island, with an area of 3,922 square miles.

Beta. See Beet.

Betanzos, bȧ-tän'thōs, city, Spain, in the province of Corunna; 14 miles southeast of Corunna. It has interesting churches of the 13th and 14th centuries and a ruined Moorish castle. There is a trade in wine and grain. Pop. (1910) 8,826.

Beta Rays. See Radium.

Betelgeux, bet'*e*l-gûz, (*a Orionis*), a red star of the first magnitude, but slightly variable. It forms a huge equilateral triangle with Procyon and Sirius.

Be'tel Leaf, or Betel Pepper, the foliage of several species of climbing peppers (*Piper*), which is used to wrap the pellets of betel nut and lime chewed in India and the Malayan Archipelago. The plants are often cultivated.

Betel Nut Palm, or Pinang (*Areca catechu*), a graceful spineless palm, a native of the Malay Peninsula. The fibrous fruit, about the size of a hen's egg, is bright orange or red in color and contains a hard seed or nut as large as a filbert. The natives cut the nuts into slices, add lime to them, roll them in a betel pepper leaf, and chew them. This habit, which is common to all Indian and Malayan races, colors the mouth and lips red and blackens and eventually destroys the teeth. Europeans in general do not care for it but it is immensely popular in the Orient. A kind of catechu is extracted from the nuts. The palm is cultivated, and the nuts are exported.

Betham-Edwards, beth'*a*m, Mathilda Barbara (1836–1919), English novelist and poet, was born in Suffolk, England, and was educated at home and in France. Her published works include *The White House by the Sea* (1855); *John and I* (1862); *Doctor Jacob* (1864); *Kitty* (1869); *A Dream of Millions* (1891); *A Storm-rent Sky* (1898); *A Suffolk Courtship* (1900); *Poems* (1885); *The Roof of France*, or *Travels in Lozère* (1899); *France of To-day* (1892–4); *East of Paris* (1902); *Barham Brockleband, M.D.* (1904); *Home Life in France* (1905); *Literary Rambles in France* (1907); *Poems* (1907); *French Men, Women and Books* (1910); *In French Africa* (1913); *Hearts of Alsace* (1916). Consult her *Reminiscences* (1898) and *Anglo-French Reminiscences* (1899).

Bethany, beth'*a*-ni, an ancient village on the southeastern spur of the Mount of Olives, Palestine; about 2 miles southeast of Jerusalem. Its site is occupied by the modern town of El Azariyeh. Bethany is frequently mentioned in the New Testament, and was a favorite resort of Jesus. It was the home of Martha and Mary and their brother Lazarus, whose reputed tomb is still shown to visitors. The house of Simon the leper, where the woman anointed Jesus with the precious ointment, was also in Bethany, and Christ's ascension took place 'over against Bethany' (Luke xxiv. 50–51).

Bethany, city, Missouri, county seat of Harrison county, on the Chicago, Burlington, and Quincy Railroad, and the Lincoln Highway; 6 miles northeast of St. Joseph. It has manufacturing interests and quarries of building stone. Pop. (1910) 1,931; (1920) 2,080.

Bethany College, a Lutheran institution for both sexes at Lindsborg, Kansas, founded in 1881. It comprises a graduate department, a school of liberal arts, a preparatory department, and schools of pedagogy, oratory, music, art, and business, and maintains a summer session. Special attention is given to the study of Swedish. For latest statistics see Table of American Colleges and Universities under the heading College.

Beth'el ('house of God'), a town in Palestine about 12 miles north of Jerusalem. It was originally called Luz and its modern name is Beitin. The town stands on a hill 2,890 feet high and is now merely a collection of wretched hovels. Abraham pitched his tent and built his altar near Bethel (Gen. xii. 8); and it was the scene of Jacob's vision (Gen. xxviii. 19). It was captured and occupied by the tribe of Ephraim (Judges i. 22), and later it was alloted to the tribe of Benjamin as their frontier town. Under Jeroboam it became the centre of the worship of Jehovah.

Bethel, town, Connecticut, in Fairfield county, on the New York, New Haven and Hartford Railroad; 16 miles northeast of New Haven. Silk, hats and leather are manufactured here. Pop. (1910) 3,792; (1920) 3,021.

Bethell, Richard, first Lord Westbury (1800–1873), English jurist, was born in Bradford-on-Avon and was graduated, at the age of eighteen, from Wadham College, Oxford. He was called to the bar as a member of the Middle Temple in 1823, was made a queen's counsel in 1840, entered parliament in 1851, and in the same year was appointed vice-chancellor of the duchy of Lancaster. In 1856 he was made Attorney General, which office he held, except for the interval 1858–59, until his appointment as Lord Chancellor in 1861. Owing to certain scandals connected with the granting of a pension, he resigned his office in 1865 and retired to private life. He soon resumed his seat in the House of Lords, however, and his last years were ones of great activity. Among his most important acts were his efforts to improve the methods of legal training, his advocacy of the codification of the law, and his zealous attempts at law reform.

Bethesda, be-thez'd*a* *or* be-thes'd*a* ('house of the stream'), a pool with five porches, in Jerusalem, where Christ healed the infirm man (John v. 2–9).

Bethesda, town, Carnarvonshire, Wales, in the great Penrhyn slate quarrying district; 4½ miles southeast of Bangor. It has been a scene of great labor disputes. Pop. (1911) 4,716; (1921) 4,134.

Beth-ho'ron, Lower and Upper, two villages, Palestine, 12 miles northwest of Jerusalem, commanding an important pass on the frontier between Benjamin and Ephraim. After his victory at Gibeon, Joshua pursued the fleeing Amorites by way of Beth-horon to Azekah (Josh. x. 10–11), and here Judas Maccabæus defeated the Syrians in 166 B.C. The modern name is Beit-Ur.

Beth'lehem, village in Palestine; 5 miles south of Jerusalem. Its modern name is Beit Lahm and it is a thriving town whose inhabitants live chiefly by agriculture and breeding cattle. They also make rosaries, crosses, and other articles of wood, mother-of-pearl, coral, and stinkstone. The most important building is the Church of the Nativity, erected over the traditional birthplace of Christ, in the eastern part of the town. There are three monasteries and several schools. Pop.about11,000,mostly Christians.

Bethlehem is famous as the home of David and the birthplace of Jesus Christ (Matt. ii. 1–6). On the approach of the Crusaders the Arabs destroyed the town but it was rebuilt by the Franks. In 1489 it was again destroyed; in 1831 the Moslems were expelled by the Christians and at present only a few remain.

Bethlehem, city, Pennsylvania, Northampton county, on the Lehigh River and Canal and on the Central of New Jersey, the Lehigh Valley, the Lehigh and New England, and the Philadelphia and Reading Railroads; 56 miles northwest of Philadelphia.

Bethlehem is especially celebrated for its annual Bach festival. The Moravian settlers here held a *Singstunde* as early as 1742, and from 1744 a Collegium Musicum was steadily maintained. This was replaced in 1820 by the Philharmonic Society, and in 1882 the Bethlehem Choral Union was organized. This gave place, in 1900, to the Bethlehem Bach Choir, which has been assisted since 1912 by members of the Philadelphia Orchestra. The festivals occupy two days.

Bethlehem is the seat of Lehigh University (q. v.), of Moravian Colleges for men and women, and of several private schools. St. Luke's Hospital, the public library, and the Church of the Nativity are noteworthy buildings. The Bethlehem Steel Corporation and Shipbuilding Corporation have their main offices here, and there are publication and construction plants, silk, knitting, hosiery, flour, and graphite mills, and manufactures of paint, spark plugs, and furniture. According to the U. S. Census of Manufactures for 1919, industrial establishments number 86, with 14,961 wage earners, a capital of $115,110,210, and a product valued at $102,567,075. The city is also a distributing centre of importance.

Bethlehem was founded by the Moravians about 1741, and became the headquarters in America of that sect. It was incorporated in 1845, and in 1904 West Bethlehem and in 1917 South Bethlehem and Northampton Heights were consolidated with it. Pop. (1910) 12,837; (1920) 50,358.

Beth'lehemites, a name assumed by several orders in the Catholic Church. Of these, one was established in 1257, in England, with a monastery at Cambridge. Another was founded in 1459, to resist the advance of the Ottoman power. A third and more important arose about 1665 in Guatemala, Central America, for the special purpose of teaching and nursing, but was secularized in 1820 and before many years became extinct. The name Bethlehemites has also been given to the disciples of John Huss (q. v.), who preached in the Bethlehem Church at Prague.

Bethlen, bet'l*e*n, GARBOR—i.e. GABRIEL—(1580–1629), Transylvanian prince, of a celebrated Hungarian family, was elected to the throne in 1613. He invaded Austria in 1619 in support of the Bohemians, and was crowned king of Hungary in 1621. Owing to the antagonism aroused by his alliance with the Turks, he was obliged to relinquish the throne.

Bethmann-Hollweg, bāt'mȧn-hōl'vȧk, THEOBALD VON (1856–1921), German statesman, was born in Hohen-Finow, Brandenburg and educated at Bonn, where he met, and became the friend of, Emperor William II. He was president of the province of Brandenburg, 1899–1905. In the latter year he became Prussian Minister of the Interior, and in 1907 Prussian Vice-Chancellor and Minister of Imperial Home Office. In 1909 he succeeded von Bülow as German Chancellor and continued in office with but one interruption during the Great War (1914–18). Bethmann-Hollweg upheld Germany's invasion of Belgium in 1914 and the phrase 'a scrap of paper' in reference to international treaties is attributed to him.

Beth'nal Green, a metropolitan and parliamentary borough of Greater London. See LONDON.

Beth-pe'or, a place east of the Jordan whose exact site is at present a matter of controversy. It was near the ravine (Deut. iii. 29; IV. 46) in which Moses was supposedly buried (Deut. xxxiv. 6) and was in the possession of the tribe of Reuben.

Beth'phage, village of Palestine, on Mount Olivet (Matt. xxi. 1; Mark xi. 1; Luke xix. 29), apparently near Bethany. It was to this village that Christ sent the disciples for the ass upon which he made his triumphal entry into Jerusalem.

Bethsaida, beth-sā'i-d*a*, town in Palestine, on the east bank of the Jordan, near its entrance into the Sea of Galilee. Here the miracle of the feeding of the five thousand (Luke ix. 10–17) took place and just outside the city Jesus healed the blind man of his infirmity (Mark vii. 22–27).

Beth-she'mesh ('house of the sun'), the name given to several places mentioned in the Old Testament. The most important of these towns was in Judah, between Kirjath-jearim and Timnah. It was the scene of an encounter between Jehoash, king of Israel, and Amaziah, king of Judah (2 Kings xiv. 11–13); was occupied by the Philistines (2 Chron. xxviii. 18); and was the first place where the Ark rested on its return from the Philistines (1 Sam. vi. 9 ff.). It is identified with the ruined village of Ain Shems, in the valley of Sorek, 15 miles southwest of Jerusalem. The name Beth-shemesh was also applied to an unidentified city on the border of Issachar (Joshua xix. 22); to a fenced city of Naphthali in Upper Galilee (Joshua xiv. 22); and to an idolatrous temple in Egypt (Jer. xviii. 13).

Bethune, bā-tün', town, department of Pas-de-Calais, France, 25 miles by rail southeast of Lille, with which it communicates by canal. Numerous rich coal mines occur in the vicinity. The chief industries are sugar making, distilling, and linen weaving; and there is trade in corn, cattle, and horses. Its celebrated belfry was erected in 1388. During the Great War Bethune was an important point in British communications. Pop. (1911) 15,309.

Bethune, bē-tho͞on', GEORGE WASHINGTON (1805–62), American clergyman and poet, was born in New York, and was graduated (1822) from Dickinson College, Pa. He prepared at Princeton for the Presbyterian ministry, and was ordained in 1825, but the following year entered the Dutch Reformed ministry, in which he held several pastorates until his acceptance of that of the church on the Heights, Brooklyn, N. Y. (1848–59). He is remembered for his interest in public affairs, his eloquence, and his poetical works.

Bethune, THOMAS. See BLIND TOM.

Bet'ony (*Stachys betonica*), a hardy herbaceous perennial belonging to the order *Labiatæ*. It has oblong leaves, three to six inches in length, and purple flowers borne in a dense terminal spike. It blooms from July to September and is often known as 'Wood Betony'.

Beto'yan, a linguistic stock of South American Indians found in eastern Colombia, and in the adjacent lands of Venezuela and Brazil.

Betroth'al, an engagement or agreement by a man and woman for a future marriage between them. In the earlier history of marriage in the Christian nations a betrothal was in effect an irregular but legalized union. It was either an engagement for a present union (*sponsalia per verba de presenti*), which, though without the sanction of the church, made the parties legally man and wife; or for a future union (*per verba de futuro*), which did not amount to a marriage unless followed either by cohabitation (called the 'consummation' of the marriage) or by the prescribed religious ceremony. The betrothal *per verba de presenti* still exists in the United States, where not restricted by statute, under the name of the Common Law marriage, though it is in some states required to be entered into in the presence of witnesses or reduced to writing and signed by the parties thereto. Cohabitation no longer has the effect of consummating a betrothal *per verba de futuro*. See MARRIAGE.

Betsiboka, riv., Madagascar, rises N. of Antananarivo, flows N. and N.W. for 200 m. to the Bombetoke Bay, Mozambique Channel, and receives the Ikopa. In the rainy season there is a navigable waterway from Majunga to the mines of Mevatanana, on the Ikopa, 148 m.

Betsileo, a negro people living in the mountainous part of Madagascar. They were subjugated by the Hovas (whom they resemble in many of their customs) at the beginning of the 19th century, and now occupy a fertile region with a healthy climate (3,750 ft. alt.), and are good agriculturists. They number about 300,000. Principal tn. Fianarantsoa.

Bettelheim, ANTON (1851), Austrian man of letters, born at Vienna; worked as a journalist (1881–6); has distinguished himself as biographer and literary critic—writing lives of Anzengruber (1891; 2nd ed. 1897) and Marie von Ebner-Eschenbach (1900); editing an excellent biographical series called *Führende Geister*, afterward *Geisteshelden* (from 1890 onwards), and *Biographisches Jahrbuch* (1898 onwards). His essays were collected as *Die Zukunft unsers Volkstheaters* (1892), *Deutsche u. Franzosen* (1895), and *Acta Diurna* (1899).

Betterton, THOMAS (1635–1710), English actor, dramatist, and theatrical manager, was born at Westminster. He appeared at the Cockpit Theatre about 1659–61. A visit made to Paris at the command of Charles II. brought him under the influence of Molière with the ultimate effect of transforming the producing and staging of plays in England. Betterton was an admirable actor, and his character ranked high in a dissolute age. He was buried in Westminster Abbey. Of the seven plays attributed to him, some are adaptations from the French or from the older dramatists, but all of them are poor in quality. See Colley Cibber's *Apology for my own Life* (new ed. 1888); R. W. Lowe's *Life of Betterton* (1891).

Bettia, tn., Champaran dist., Bengal Presidency, India. Pop. (1901) 24,636.

Bettinelli, SAVERIO (1718–1808), Italian writer, was born at Mantua. A Jesuit, he was successively teacher of rhetoric at Venice (1748), of history and literature at Parma (1751), and of eloquence at Modena. He was the author of many tragedies and poems, but he is best known in Italian literature as the writer of an elaborate treatise on *Il Risorgimento d'Italia, negli Studii, nelle Arte e ne' Costumi dopo il Mille* (1775). In 1801 an edition of his collected *Opere* was published in 24 vols. See Napione's *Vita* (1819), and Tipaldo's *Biografia degli Italiani Illustre* (10 vols. 1834–45).

Betting. The common method of betting on races in the United States is by what is known as bookmaking. At the race tracks a part of the enclosure is set aside for bookmakers who offer odds against every horse in a race, and the astute layer of odds so arranges his book, making his risks on the percentage plan, that he may win no matter which horse is first. If he finds that one horse is a popular favorite he will give odds which either discourage betting on it or reduces the amount he risks to a minimum as far as possible and induces the public to bet on other horses by offering longer odds against them until he has succeeded in rounding out his book. He constantly shifts the odds according to the market and his accounts, and thus generally succeeds in getting every horse backed by the public. If he finds toward the close of the betting on the race that he has overloaded himself with too much on one horse he generally goes to some other bookmaker and bets with him to make his own book more even. But occasionally he fails to protect himself and loses, which, however, is not often if he is cautious.

His plan is about as follows: With the betting at 4 to 5 against A, 2 to 1 against B, 7 to 1 against C, and 10 to 1 against D, he would lay $2,000 against $2,500 A, $3,000 against $1,500 B, $4,200 against $600 C, and $4,000 against $400 D. Thus if A wins he wins $500, B, $500; C, $200; and D, $600. This is an ideal sheet, and every bookmaker would like the public to accept such a rating. Competition, however, forces changes in these odds, and the layer may have to alter his figures a dozen times in the half hour allowed before each race for the betting, and it has to be a clear-headed man who can keep the run of his accounts and make them show him a winner when he takes the last bet on the race. Sometimes the bookmaker fancies a certain horse in a race and takes liberties with the others to his loss. Sometimes he may 'lay against' the favorite, that is, give longer odds than the market warrants owing to his belief that the horse cannot win, but the long-headed, winning bookmaker always works on the percentage plan and is satisfied to make a book which will leave him a moderate winner at the end of the day. Books are also made outside of the racetrack on the same principle, particularly what are known as 'winter books,' in which the bookmaker lays odds on the big races as soon as the weights are allotted. These can be much more easily rounded up as they are absolutely on the percentage plan, and every horse that is scratched from the race is clear profit, as the bets are made 'play or pay.'

In most of the United States betting is illegal, while in a few states open betting is permitted.

In New York State, until 1908, it was illegal to conduct a betting establishment outside of a race track, but there betting was allowed, in spite of constitutional prohibition. When Gov. Hughes assumed office in that year, he had bills prepared which made gambling in or out of race tracks illegal, and bookmaking a misdemeanor, punishable by a year's imprisonment. After vigorous opposition, which prevented the passage of the bills in regular session, the Governor called an extra session of the Legislature, and the Percy-Gray measure became law, passing the Senate by a majority of only one vote. This law, vigorously enforced, caused a great falling off in attendance and value of purses at the Metropolitan tracks.

The *paris-mutuels* or 'mutual bets' system of wagering, is used in America rarely. In this system all the money bet on a race is taken in by the club conducting the event, and the total amount received is divided by the number who have bet on the winning horse, each bettor receiving a ticket for each time he bets $5. Before the division is made a certain percentage of the total is taken out by the club for expenses. See also article on GAMING.

Betto, BERNARDO DI. See PINTURICCHIO.

Betts, SAMUEL ROSSITER (1787–1868), American jurist, was born at Richmond, Mass., and graduated (1806) at Williams. He served in the War of 1812, and in Congress. In 1823 he was appointed judge of the U. S. district court, retiring the year before his death. He became a great authority on maritime law, and published a standard work on *Admiralty Practices* (1828).

Bettws-y-Coed, par. vil., and tourist resort, Carnarvonshire, Wales, 3 m. S. of Llanrwst; beautifully situated among pine-clad hills, at the junction of the Llugwy with the Conway. The Swallow Falls, Fairy Glen, and Miner's Bridge are much visited by tourists. It was a favorite haunt of David Cox, and is an excellent centre for fishing, and for exploring the Snowdon district. Pop. (1911) 925.

Betty, William Henry West (1791–1874), a precocious boy actor, known as the 'Young Roscius,' was born at Shrewsbury. He first appeared at Belfast in 1803, and till 1806 played in London and the provinces. He retired from the stage in 1807 with a large fortune. He reappeared in 1812–24, without success. See his autobiographical *Life of Young Roscius* (1804), and Hutton in *Actors and Actresses of Great Britain and the United States*, vol. ii. (1886).

Betul, a hilly dist. in Central Provs., India; forms the W. section of the great Satpura plateau. It was once the centre of the ancient Gond kingdom of Kherla. Coal is found. Area, 3,826 sq. m. Pop. (1901) 285,363.

Betwa, riv., rising in the Vindhya Mts., Bhopal, Central India Agency; flows N.E. through Bundelkhand, and joins the Jumna on the r. bk. near Hamirpur, after a course of nearly 400 m.

Beulé, Charles Ernest (1826–74), French politician and archæologist, became professor of rhetoric at Moulins, and in 1849, while teaching at the archæological school of Athens, he discovered the propylæa of the Acropolis. Appointed professor of Archæology at the Bibliothèque Nationale of Paris in 1854, his prolific literary activity was interrupted in 1858–9 to pursue investigations on the site of Carthage. Entering the National Assembly as an Orleanist in 1871, he held the portfolio of the interior under MacMahon in 1873. He published *L'Acropole d'Athènes* (1854); *Etudes sur le Peleponnese* (1855); *Les Monnaies d'Athènes* (1858); *L'Architecture au Siècle de Pisistrate* (1860); *Phidias, Drame antique* (1863); *Causeries sur l'Art* (1867); *Histoire de l'Art grec avant Péricles* (1868); *Le Sang de Germanicus*, and other works. See Ideville's *Monsieur Beulé, Souvenirs Personnels* (1874).

Beust, Friedrich Ferdinand, Count von (1809–86), German and Austrian statesman, was born at Dresden. He entered (1831) the Saxon diplomatic service, and became minister of foreign affairs in 1849. He defended the rights of the smaller German states against the aggressions of Austria and Prussia; but in 1866, after the defeat of the former power, he was obliged to resign office. On the invitation of the Emperor Francis Joseph, he became minister of foreign affairs for Austria, and at once began a complete reorganization of the Austrian empire. In 1867 he became president of the ministry and chancellor of the empire. He succeeded in conciliating Hungary, and secured the emperor's coronation as king of Hungary at Pesth, and carried out many reforms. He was dismissed from the control of the government and the office abolished, after the proclamation of the German empire in 1871, and was subsequently appointed ambassador to Britain (1871), and to Paris (1878). Beust's *Memoirs* have been translated into English, with an introduction by Baron Henry de Worms (1887).

Beuthen, tn., prov. Silesia, Prussia, 120 m. by rail S.E. of Breslau, and only 2½ m. from the Polish frontier; stands in the middle of the Upper Silesian coal, iron, and zinc industries. Pop. (1880) 22,811; (1900) 51,404.

Beveland. (**1.**) North, isl., prov. Zeeland, Netherlands; lies N. of Walcheren and S. Beveland, and is washed on the N. by the E. Scheldt. It is 12 m. long by 4 m. broad. (**2.**) South, isl., prov. Zeeland, Netherlands; lies between the E. and W. Scheldt, behind the island of Walcheren. It is 25 m. long by 5 to 6 m. wide, and is bisected by the S. Beveland Canal, made in 1866. In 1530 and 1532 it was overwhelmed by the sea, but has since been entirely reclaimed. Its chief town is Goes, or Ter Goes.

Beveridge, Albert Jeremiah (1862), American senator, was born on a farm at the junction of Adam and Highland cos., O., and graduated (1885) at De Pauw University, Ind. He studied law in the office of Senator McDonald, became his managing clerk, and was associated with the law firm of McDonald & Butler until he began practice on his own account. He gained a wide reputation as a public speaker, and was elected Republican U. S. senator from Indiana for the term ending 1905, and was reëlected on its expiration. Author of *The Russian Advance* (1904), *The Young Man and the World* (1905), and many magazine articles.

Beveridge, Kühne (1877), American sculptor, grand-daughter of ex-Gov. John L. Beveridge, was born at Springfield, Ill., and studied with W. R. O'Donovan in New York, and with Rodin at Paris. She was married, first, to Charles Coghlan, 1893, and, second, to William B. Branson, of Johannesburg, Transvaal, 1903. Exhibited at the New York and London academies, and at Paris, where she received an honorable mention at the Exposition of 1900.

Beverley, par. and munic. bor., E. Riding of Yorkshire, England, 8 m. N.W. of Hull. The twin-towered church of St. John (Beverley minster) is one of the finest ecclesiastical buildings in England, the 14th century 'Percy shrine' being of exquisite design and workmanship. The other parish church is that of St. Mary's. Beverley is the seat of a suffragan bishop. Tanning, brewing, iron-founding, and agricultural implement making. Pop. (1911) 13,654.

Beverley, Robert (1675–1716), American colonial historian, born in Va. He was educated in England, and for some time was assistant in charge of the Va. colonial records. Primarily in order to correct Oldmixon's *British Empire in America*, the proofs of which he saw while in London in 1703, he wrote a *History of Virginia* (1705; new ed. considerably enlarged, 1722; re-issued, 1855), the first history of the colony written by a native Virginian, and a work of great value, particularly those parts which deal with the Indians and with contemporary affairs.

Beverly, seapt., Essex co., Mass., 16 m. N.E. of Boston, on the N. side of a narrow bay separating it from Salem, and on the Bost. and Me. R. R. It is the seat of the New England School for the Deaf, a hospital and a public library. Its manufactures include carriages, machinery, shoes, morocco, oiled clothing, belting, etc. The fisheries and navigation afford employment to a large number of the inhabitants. Pop. (1910) 18,650.

Beveziers, Battle of. See Beachy Head, Battle of.

Bevis of Hampton, or the French *Beuve d'Hanstone*, was the name of one of the oldest Italian romances of chivalry, popular in mediæval England. Included in the Carlovingian cycle of romances, the subject is an old French story, written in *ottava rima* in the beginning of the 14th century, published in 1489, and printed by Vérard as a French prose romance in 1500. An English poetical version of the story was edited by Dr. E. Kölbing for the Early English Text Society (1885).

Bewick, Thomas (1753–1828)

the sanction of the church, made the parties legally man and wife; or for a future union (*per verba de futuro*), which did not amount to a marriage unless followed either by cohabitation (called the 'consummation' of the marriage) or by the prescribed religious ceremony. The betrothal *per verba de presenti* still exists in the United States, where not restricted by statute, under the name of the Common Law marriage, though it is in some States required to be entered into in the presence of witnesses or reduced to writing and signed by the parties thereto. Cohabitation no longer has the effect of consummating a betrothal *per verba de futuro*. See MARRIAGE.

Betsiboka, bet-si-bō'kä, river, Madagascar, rises north of Antananarivo and flows north and northwest for 300 miles to Bombetoke Bay, Mozambique Channel. Its chief tributary is the Ikopa.

Betsileo, bet-si-lā'o, a Malayan people living in the mountainous region of South Central Madagascar. They were subjugated by the Hovas, whom they resemble in many of their customs, at the beginning of the 19th century. Their lands are fertile, and they are good agriculturists. They number about 480,000. Their chief town is Fianarantsoa.

Bettelheim, bet'*e*l-hīm, ANTON (1851–), Austrian man of letters, was born in Vienna. He worked as a journalist (1881–6) and distinguished himself as a biographer and literary critic. He wrote lives of Beaumarchais (1886, 2d ed. 1911), Anzengruber (1891; 2d ed. 1897), Marie von Ebner-Eschenbach (1900), Louise von François und Conrad Meyer (1905), Auerbach (1907), and Prince Hohenlohe (1910), and edited an excellent biographical series called *Führende Geister*, afterward *Geisteshelden* (from 1890 onwards), and *Biographisches Jahrbuch* (1898 onwards). His essays were collected as *Die Zukunft unsers Volkstheaters* (1892), *Deutsche und Franzosen* (1895), and *Acta Diurna* (1899).

Bet'tendorf, city, Iowa, Scott county, on the Mississippi River, and on the Chicago, Burlington and Quincy, the Chicago, Milwaukee and St. Paul, and the Davenport, Rock Island and Northwestern Railroads; 3 miles east of Davenport. The manufacture of steel cars is the chief industry. Pop. (1910) 909; (1920) 2,178.

Bet'terton, THOMAS (1635–1710), English actor, dramatist, and theatrical manager, was born in Westminster. He was apprenticed to a bookseller, but further accounts of his early life are somewhat conflicting. He seems to have joined a theatrical troupe and appeared at the Cockpit Theatre about 1659. In 1661 he became a member of Sir William Davenant's company at Lincoln's Inn Field Theatre, and soon gained a high reputation. A visit made to Paris at the command of Charles II. brought him under the influence of Molière, with the ultimate effect of transforming the producing and staging of plays in England. Betterton was an admirable actor, of fine personal character. His repertoire included many of Shakespeare's plays as well as his own and other contemporary dramas. As a playwright he is less notable. Of the seven plays attributed to him some are adaptations from the French or from the older dramatists, but none of them takes high rank. Betterton's wife was an actress of high attainments.

Consult Howe's *Thomas Betterton;* Baker's *History of the London Stage and Its Famous Players.*

Bettia, be-tē'*a*, or BETTIAH, town, Bengal, India. It has trade in indigo. Pop. 25,800.

Bettinelli, bet-tē-nel'lē, SAVERIO (1718–1808), Italian writer, was born in Mantua. He entered the Jesuit order, and was successively teacher of rhetoric at Venice (1748), of history and literature at Parma (1751), and of eloquence at Modena. He was the author of many tragedies and poems, but he is best known in Italian literature as the writer of an elaborate treatise on *Il risorgimento d'Italia, negli studii, nelle arte e nei costumi dopo il mille* (1775). In 1801 an edition of his collected works was published in 24 vols. Consult Napione's *Vita dell'Abbate S. Bettinelli*, and Tipaldo's *Biografia degli Italiani illustre.*

Betting may be defined as a system of making contracts, under which payment by one party to another is dependent on an uncertain event, usually the result of a game or race. An ordinary commercial transaction in which a party buys property in the hope of selling it at a higher price is not regarded as such, nor is a contract of insurance or of indemnity against risks a wager unless the party taking out the policy has no insurable interest.

At common law no form of wagering is criminal, but there has been a difference of judicial opinion whether contracts of this description are *per se* valid and enforceable in a court of justice. The English courts have held that they are, the American courts that they are not. The views which modern legislation as a rule has taken of the matter is that the mere conclusion of a bet is not criminal, but keeping a betting house or using the street or other public place for carrying on a betting business is an offense against public order.

Until comparatively recently the staking of money on horse races was the chief form of public betting in the United States. The common method is by what is known as bookmaking: At the race tracks a part of the enclosure is set aside for bookmakers, who offer odds against every horse in a race, so arranging their books, making their risks on the percentage plan, that they may win no matter which horse is first. If one horse is a popular favorite, the bookmaker will give odds which either discourage betting on it or reduce the amount he risks to a minimum, inducing the public to bet on other horses by offering longer odds against them until he has succeeded in rounding out his book. He constantly shifts the odds according to the market and his accounts, and thus generally succeeds in getting every horse backed by the public.

In most of the United States betting is forbidden or restricted by law. In New York State, until 1908, it was illegal to conduct a betting establishment outside of a race track, but there betting was allowed, in spite of constitutional prohibition. In that year Governor Charles E. Hughes secured the enactment of legislation prohibiting the posting of odds at race-courses and elsewhere, and forbidding the passing of money from hand to hand. In 1910 a more drastic series of laws was passed in the same State, whereby betting of every description, 'orally or otherwise,' became a misdemeanor.

The 'Pari-mutuel' or 'totalizer' is a betting machine fitted with a number of receptacles. The backer places his stake in the receptacle appropriated to the horse he favors, and at the end of the race the supporters of the successful horse divide up all the money staked on the different horses, less 10 per cent., which goes to the owner of the machine. In England and the United States generally all such betting machines are illegal.

See also GAMBLING; HORSE RACING; LOTTERY.

Betto, BERNARDO DI. See PINTURICCHIO.

Betts, SAMUEL ROSSITER (1787–1868), American jurist, was born in Richmond, Mass. He was graduated from Williams College (1806), served in the War of 1812, and in Congress. In 1823 he was appointed judge of the U. S. district court, in which capacity he served until the year before his death. He was an authority on maritime law, and published a standard work on *Admiralty Practices* (1838).

Bettws-y-Coed, bet′o͞os-i-kō′-ed, urban district, Carnarvonshire, Wales, 3 miles south of Llanrwst. It is beautifully situated among pine-clad hills, at the junction of the Llugwy with the Conway, and is much visited by tourists. It was a favorite haunt of David Cox, and is an excellent centre for fishing, and exploring the Snowdon district. Pop. (1921) 1,027.

Betty, WILLIAM HENRY WEST (1791–1874), boy actor, known as the 'Young Roscius,' was born in Shrewsbury. He made his first stage appearance in Belfast in 1803, and till 1806 played in London and the provinces. He retired from the stage in 1807 with a large fortune. He reappeared in 1812–24, without success. Consult his autobiographical *Life of Young Roscius* (1804), and Hutton's *Actors and Actresses of Great Britain and the United States.*

Betul, bā-to͞ol′, town and district, India, in the Central Provinces. The district forms the western section of the great Satpura plateau. It was once the centre of the ancient Gond kingdom of Kherla. Cotton and teak are produced. Area, 3,826 square miles. Pop. (1911) dist. 390,386; town 5,473.

Betula. See BIRCH.

Bet′wa, river, British India, rises in the Vindhya Mountains, Bhopal, flows northeast through Bundelkhand, and joins the Jumna near Hamirpur, after a course of nearly 400 miles.

Beulé, bē′lā′, CHARLES ERNEST (1826–74), French politician and archæologist, was born in Saumur. He became professor of rhetoric at Moulins, and in 1849, while teaching at the archæological school of Athens, he discovered the propylæa of the Acropolis. He was appointed professor of archæology at the Bibliothèque Nationale of Paris in 1854, and in 1858–9 was engaged in investigations on the site of Carthage. Entering the National Assembly as an Orleanist in 1871, he held the portfolio of the interior under MacMahon in 1873. He published *L'acropole d'Athènes* (1854); *Etudes sur le Peleponnese* (1855); *Les monnaies d'Athènes* (1858); *L'architecture au siècle de Pisistrate* (1860); *Phidias, drame antique* (1863); *Causeries sur l'art* (1867); *Histoire de l'art grec avant Péricles* (1868); *Le sang de Germanicus,* and other works. He met death by suicide. Consult Ideville's *Monsieur Beulé, souvenirs personnels.*

Beust, boist, FRIEDRICH FERDINAND, COUNT VON (1809–86), German and Austrian statesman, was born in Dresden. He entered the Saxon diplomatic service in 1831, and became minister of foreign affairs in 1849. In 1853 he was also placed at the head of the interior department and as chief of the two most politically important departments was the leading minister of the cabinet. He defended the rights of the smaller German states against the aggressions of Austria and Prussia; but in 1866, after the defeat of the former power, he was obliged to resign office. In 1866, on the invitation of the Emperor Francis Joseph, he became minister of foreign affairs for Austria, and at once began a complete reorganization of the Austrian Empire. In 1867 he became president of the ministry and chancellor of the Empire. He succeeded in conciliating Hungary, and secured the Emperor's coronation as king of Hungary at Pesth, and carried out many reforms. He was dismissed from the control of the government, and the office of chancellor was abolished, after the proclamation of the German Empire in 1871. He was subsequently ambassador to Great Britain (1871–8), and to France (1878–82). Beust's *Memoirs* have been translated into English, with an introduction by Baron Henry de Worms.

Beuthen, boi′t*e*n, town, Prussia, in Upper Silesia, 120 miles southeast of Breslau and close to the Polish frontier. There are a good Rathaus, a sixteenth century church, and an old timber church standing in the town park. It is an important mining centre. Pop. (1919) 53,238.

Beveland, bā′v*e*-lant, NORTH AND SOUTH, two islands of the Netherlands, in the province of Zeeland, lying in the estuary of the Scheldt. North Beveland is 12 miles long and 4 miles wide; while South Beveland, lying just back of Walcheren, is about 25 miles long and 5 to 6 miles wide. In 1532 South Beveland suffered a terrible inundation of the sea and 3,000 persons were drowned. The chief town is Goes.

Bev′eridge, ALBERT JEREMIAH (1862–), American senator and author, was born on a farm at the junction of Adam and Highland counties, Ohio, and was graduated (1885) from De Pauw University. He studied law in the office of Senator McDonald, became his managing clerk, and was associated with the law firm of McDonald & Butler until he began practice for himself. He gained a wide reputation as a public speaker, and was U. S. Senator (Republican) from Indiana (1899–1911). He wrote *The Russian Advance* (1904), *The Young Man and the World* (1905), *The Bible as Good Reading* (1906), *Americans of Today and Tomorrow* (1908), *Work and Habits* (1908) *Life of John Marshall* (1916).

Died Apr. 27, 1927

Bev′erley, market town, England, in East Riding, Yorkshire; 8 miles northwest of Hull. The twin-towered church of St. John (Beverley minster) is one of the finest ecclesiastical buildings in England, the 14th century 'Percy shrine' being of exquisite design and workmanship. St. Mary's church is also unusually beautiful. The chief industries are tanning, brewing, iron founding, and the manufacture of agricultural implements. Pop. (1921) 13,469.

Beverley, ROBERT (1675–1716), American colonial historian, was born in Virginia. He was educated in England, and for some time was assistant in charge of the Virginia colonial records. Primarily in order to correct Oldmixon's *British Empire in America,* the proofs of which he saw while in London in 1703, he wrote a *History of Virginia* (1705; new ed. considerably enlarged, 1722; re-issued, 1855), the first history of the colony written by a native Virginian, and a work of great value, particularly for its discussions of the Indians and contemporary affairs.

Beverly, city and seaport, Massachusetts, Essex county, on the north side of a narrow bay separating it from Salem, and on the Boston and Maine Railroad; 16 miles northeast of Boston. It is the seat of the New England School for the Deaf, a hospital, and a public library. According to the Federal Census for 1919, industrial establishments number 70, with $18,064,021 capital, and products valued at $21,829,684. They include manufactures of carriages, machinery, shoes, oiled clothing, and belting. Fishing and navigation afford employment to a large number of the inhabitants. Pop. (1900) 13,884; (1910) 18,650; (1920) 22,561.

Beverly, city, New Jersey, Burlington county, on the Delaware River, and the Pennsylvania Railroad; 14 miles northeast of Camden. Pop. (1910) 2,140; (1920) 2,562.

Beveziers, BATTLE OF. See BEACHY HEAD, BATTLE OF.

Bevis of Hampton, also known as *Beuve de Hanstone,* originally perhaps a viking tale of the tenth century; in its extant form a typical romance of adventure popular in mediæval England. Bevis seems to have been an international character, as there are versions of his wanderings and exploits in French, Italian, Dutch, Welsh, Scandinavian, and Russian, and his travels include the length and breadth of Europe. The writer of the English version probably followed a French original, adding many details. Consult Laura Hibbard's *Three Middle English Romances.*

Bewick, THOMAS (1753–1828),

English wood-engraver, who revived the art, first attracting notice in 1775, and brought it to a perfection which it had never previously attained. Among his best works were the illustrations to a *General History of Quadrupeds* (1790), *History of British Birds* (1809), *Æsop's Fables* (1818), and blocks for editions of the poets printed by Bulmer of the Shakespeare Press. His woodcuts are much prized by collectors. In 1870 an edition of over two thousand *Bewick Woodblocks* was issued by Reeve. See *Memoir of T. Bewick by himself* (1862), and *Lives* by Thomson (1882), Dobson (1884), and Rosin (1888); Jackson and Chatto's *Hist. of Wood-engraving* (1861), Linton's *Hints on Wood-engraving* (1879), Hamerton's *Graphic Arts* (1882), Clement's *Painters, Sculptors, Architects, and Engravers* (1899); also Anver's *Elementary History of Art* (1875).

Bexhill, or BEXHILL-ON-SEA, coast par. and wat.-pl., E. Sussex, England, 5 m. s.w. of Hastings; 7,999 ac.; a *kursaal* of the continental type. Pop. (1901) 12,210.

Beyle, MARIE HENRI (1783–1842), French author, known under the pseudonym of 'Stendhal' (from Stendal, the home of Winckelmann, whom he greatly admired), was born at Grenoble, and served in the army during the Napoleonic invasions of Italy and Russia. From 1830 to 1833 he was French consul at Trieste, which post he exchanged for a similar one at Civita Vecchia (1833–41). In 1831 his greatest novel, *Le Rouge et le Noir*, appeared; and in 1839 *La Chartreuse de Parme* brought him additional fame. Among his other works are *L'Histoire de la Peinture en Italie* (1817) and *De l'Amour* (1822). He also attracted notice by *Shakespeare et Racine* (1825), a manifesto in favor of romanticism. His writing is brilliant, morbid, and cynical; but the plots of his novels are weak, displaying a constant straining after effect which is never realized. Prosper Mérimée is regarded as his pupil. Two excellent accounts of Beyle and his literary career have been written—Paton's *Henry Beyle* (1874) and Rod's *Stendhal* (1892). See also Sainte-Beuve's *Causeries du Lundi*, Maurice Hewlet's introduction to *La Chartreuse de Parme* (1902), Chuquet's *Stendhal-Beyle* (1902), and Stryienski's *Comment a vécu Stendhal?* (1900).

Beyrich, HEINRICH ERNST (1815–96), German geologist and palæontologist, born at Berlin, where he became (1856) professor of geology and palæontology at the university, and (1873) director of the geological department. He published the geological chart of Germany, due in great part to his labors. Among his principal works are *Untersuchungen über Trilobiten* (2 vols. 1846); *Konchylien des Norddeutschen Tertiärgebirges* (1853–7); *Ueber einge Cephalopoden aus dem Muschelkalk der Alpen* (1867).

Beyrout. See BEIRUT.

Beyschlag, WILIBALD (1823–1900), German evangelical writer, and professor of theology at Halle (1860–1900). He published numerous works, including *Die Christologie des Neuen Testaments* (1866), *Das Leben Jesu* (3rd ed. 1893), *Neutestamentliche Theologie* (1891–2; trans. 1896), *Der Brief des Jakobus* (6th ed. 1897), *Der Altkatholizismus* (3rd ed. 1883), and *Aus meinem Leben* (1896–9).

Wood-Engraving by Bewick: the Yellowhammer.

Beza, THÉODORE, or DE BÈZE (1519–1605), Genevan reformer, was born at Vézelay. In 1548 his religious convictions became so strong that, on recovering from a severe illness, he felt compelled to join Calvin at Geneva. Earlier in the same year appeared his *Poëmata Juvenilia*, the publication of which he afterward deeply regretted. For about ten years he was professor of Greek at Lausanne; but returning to Geneva in 1558, he was appointed professor of theology and president of the college. While at Lausanne he published (1550) a drama, *Abraham's Sacrifice*. The consummate tact with which he conducted negotiations on behalf of the oppressed Vaudois, or Waldenses, in 1557 and 1558, led to his appointment as representative of the Protestants at the conference of Poissy (1561). Detained in Paris by the religious wars, he became the most trusted adviser of the Reformed leaders. In 1563 he returned to Geneva, and on Calvin's death, in the following year, was appointed his successor. In 1562 the French government permitted the publication of the Huguenot Psalter, most of which was written by Beza. To him also the Huguenots owed the final revision of their Bible. He presented Cambridge University with the uncial New Testament MS. known as the Codex Bezæ. (See BIBLE.) His best-known works are his edition of the Greek Testament (1565), his *Histoire Ecclésiastique des Eglises Réformées du Royaume de France* (1586; new ed. 1883), and his translation of the New Testament into Latin (1556). See H. M. Baird's *Life of Beza* (1899), and bibliography there.

Bezant, in heraldry, one of the charges called roundels; is a small disk of gold. On the Continent it may be either gold or silver.

Bezant of Manuel I. (1143-1180).

Bezants, the coins of the Byzantine empire, but specially the gold bezant (*bizancium, nummus aureus* or *solidus aureus*), struck between 395 and 1453, and varying in value between ten shillings and twenty shillings for the gold piece, and between one and two shillings for the silver. The *dinar* of the caliphate was called by the crusaders the 'Saracen bezant,' and this latter coin gradually displaced the Greek bezant. For centuries the bezant was used as the basis of all transactions between the East and the West, but it eventually gave way before the Venetian ducat.

Béziers, tn., dep. Hérault, France, beautifully situated on the slope of a hill overlooking the fertile valley of the Orb, and on the Canal du Midi, 50 m. by rail S.W. of Montpelier. There are remains of a Roman amphitheatre. Largely a commercial town, Béziers has an important market for wines, fruit, and cattle. The crusade against the Albigenses resulted, in 1209, in the wholesale massacre of the inhabitants. Pop. (1901) 52,310.

Bézique, a card game in which the name *bézique* is applied to the occurrence in one hand of the knave of diamonds and queen of spades, may be played by two, three, or four persons, with two, three, or four packs of cards from which have been removed cards with from two to six pips; the remaining cards rank in this order—ace, ten, king, queen, knave, nine, eight, seven. If two are playing, eight cards are dealt to each, thus leaving forty-eight to form what is called 'stock.' the top card of which is turned up for trumps. It is laid at the side of the stock, of which it is the last or bottom card. The non-dealer leads, the dealer follows, not necessarily in the same suit. If he play a higher card of the suit led, or trumps, he secures the lead. After every trick the players each draw a card from the stock, the winner of the trick taking the top one, his opponent the next. Thus they continue to play and draw alternately until the stock is exhausted. After that point the second player must follow suit when possible, and take the trick when he can. The first to score 1,000 points wins the game. If his opponent has not scored 500, the game counts double.

The objects of the play are (1) to promote in the hand certain combinations of cards to which, on being declared, different scores attach; (2) to win aces and tens; and (3) to win the so-called last trick—so named not because it is the last trick of the hand, but because it is the trick just before the drawing of the last cards from the stock. Combinations of cards are declared by the winner of a trick before he draws from the stock, the cards (one of which must not have been declared before) being placed face upwards upon the table, where they remain still part of the hand and still playable, as though they had not been declared. A player is not obliged to declare, though he may win a trick and hold scoring combinations. Only one declaration may succeed one trick. The combinations, on being declared, count as follows:—Class 1. Marriage (king and queen of any suit), 20; royal marriage (king and queen of trump suit), 40; sequence of five highest trumps (ace, ten, king, queen, and knave), 250. Class 2. Bézique (queen of spades and knave of diamonds), 40; double bézique (all the bézique cards), 500. Class 3. Any four aces, 100; any four kings, 80; any four queens, 60; any four knaves, 40. Each ace and ten won in tricks counts 10. The last trick counts 10. In turning trumps, the dealer scores 10 if he turn the seven; either player scores 10 for exchanging from the hand a seven of trumps for a turned trump not a seven, and 10 for declaring the second seven of trumps, which is simply shown on being declared, and not put on the table. See A. Howard Cady's *Bézique*.

Bezoar, a morbid concretion occasionally found in the stomach and intestines of ruminants (*e.g.* antelopes, llamas, chamois, wild goat, and domestic cattle), formed by lime or magnesium phosphate adhering to some foreign substance, or by a portion of undigested food. The 'Oriental bezoar stone,' as it is termed, sometimes consists of a ball entirely of hair or vegetable fibre; and the one regarded as most efficacious as cure for disease, to which use this substance has long been applied, is taken from the Persian wild goat. These hair balls are frequently found in the stomachs of British cattle, their origin being ascribed to the common habit of a cow licking the hide of its calf or of another cow. In the East it was believed that the bezoar was an antidote for poison. Lionel Wafer, in his *Voyage and Description of the Isthmus of America* (1699), says that out of the stomach of a llama he took thirteen bezoar stones, some resembling coral, some round, and all green at first, though afterward they turned of an ash color.

Bezwada, tn., Krishna disttrict, Madras Presidency, India; of some commercial importance since the introduction of the railway. Has rock-cut Buddhist temples. Pop. (1901) 24,224.

Bhagavad Gita ('The Song of the Blessed One') is the work of an unknown author, and the date of its inclusion in the *Mahabharata*, of which it forms part of book vi., is also unknown. The song inculcates that remarkable development of Hinduism called *bhakti*, the doctrine of faith. The poem has at all times exercised a powerful influence on the hearts and minds of the worshippers of Vishnu. Attempts have been made to identify the Krishna of the poem with Christ, and to ascribe the striking resemblance of many of its verses with those of Holy Writ to the influence on Hinduism of early Christians and Jews—a theory combated by the late Kasinath T. Telang of Bombay in his scholarly treatise on the *Bhagavad Gita* in vol. viii. (1898) of Max Müller's *Sacred Books of the East*. It has also been translated into English by Davies (1882) and Sir Edwin Arnold, *The Song Celestial* (1885).

Bhagavatapurana. See PURANAS.

Bhagirathi. **(1.)** Branch of the Ganges, in Bengal, India; passes through the Murshidabad dist., joins the Jalangi, becoming the Hugli. **(2.)** River in Garhwal state, India; joins the Alaknanda at Deoprayag, and forms the Ganges.

Bhainsror, tn., and fort in Udaipur dist., Rajputana, India, 120 m. S.E. of Ajmere; has vast ruins of ancient temples to Siva.

Bhamo, tn. on l. bk. of Irawadi 40 m. W. of Chinese frontier, and over 200 m. by rail and river N.E. of Mandalay, Upper Burma. It is an important caravan centre between China and Burma, and marks the limit of navigation on the Irawadi. Pop. (1901) 9,134.

Bhandara, tn., Bhandara dist., Central Provinces, India, on the Wainganga R. Pop. (1901) 14,023.

Bhang, BANG, or BANGUE, the Indian name for the dried leaves of the hemp plant (*Cannabis indica*); strongly narcotic, and used either with or without tobacco or opium for smoking. An infusion gives the drink *hashish*, which produces a peculiar delirium, and catalepsy. A sweetmeat called *majun* is also made with the leaves. The drug is used in medicine as an anodyne, hypnotic, and antispasmodic.

Bhanpura, walled tn., 60 m. S. of Kotah, Indore state, Central India. Pop. about 20,000.

Bhartpur, or BHURTPORE, cap. of the feudatory state of the same name, in Rajputana, India. In 1805, the British, under Lord Lake, made four unsuccessful attempts to capture the fort, which was stormed by Lord Combermere in 1827. Pop. (1901) 43,601. The state has an area of 1,982 sq. m., and a pop. in 1901 of 626,665.

Bhartrihari, a Hindu poet who is believed to have flourished in the 1st century. He is the reputed author of the *Three Centuries* (*Satakas*) of Sanskrit apophthegms upon love, wise conduct of life, and renunciation of the world. The best edition of his writings is that edited by K. T. Telang, in the 'Bombay Sanskrit Series'; and there are translations by C. H. Tawney (1877) and B. H. Wortham (1886).

Bhaunaghar, bou'nug-ur, or Bhavanagar, chief town and port of the state of Bhaunaghar, Kathiawar peninsula, Bombay, India. It has large exports of cotton. Pop. (1921) 59,392.

Bhavabhuti, buv-*a*-bo͞o'ti, a celebrated Indian dramatist of the 7th and 8th centuries, who, with Kalidasa and Harsha, completes the great dramatic trio. Three of his plays have survived—*viz.* the *Malati-madhava, Maha-vira-carita,* and *Uttara-rama-carita;* the history of Rama forming the subject of the latter two. The first, which is sometimes called the Hindu 'Romeo and Juliet,' has been translated by H. H. Wilson in *Theatre of the Hindus* (3rd ed. 1871), the second by J. Pickford (1871), and the third by C. H. Tawney (1874).

Bhavishyapurana. See Puranas.

Bhel. See Bael and Œgle.

Bhils, bēlz, an aboriginal tribe who inhabit the hilly tracts of the Vindhya range, Central India, and the jungles of Khandesh district, Bombay Presidency. They are a primitive, dark, sturdy race of hunters. Their territory is traversed by the Narbada, which they regard with the utmost veneration and fear. Of a low civilization, they are improving under British rule, and are remarkable for their truthfulness and fidelity. They number nearly two millions.

Bhiwani, bē-wä'ni, town, Punjab, India, in Hissar district, 70 miles northwest of Delhi. It is a commercial centre, with an important trade in sugar, salt, pepper, and metals. Pop. (1921) 33,270.

Bhopal, bō-pôl', chief town of the feudatory state of Bhopal, Central India, 105 miles northeast of Indore. The Bhopal dynasty was founded at the beginning of the 18th century by Dost Mohammed, an Afghan in the service of Aurungzebe. Pop. (1921) 45,094.

Bhor, bôr, a feudatory state, Bombay Presidency, India; area, 1,491 square miles. Pop. (1921) 130,420. The capital is Bhor.

Bhotan. See Bhutan.

Bhuj, bo͞oj, capital of feudatory state of Kutch, Bombay Presidency, India; 180 miles southeast of Haidarabad. It has several interesting mosques and is famed for its gold and silver articles. Pop. (1921) 19,281.

Bhurtpore. See Bhartpur.

Bhusawal, bo͞o-sä'wal, town, Bombay Presidency, India, in Khandesh district; 115 miles south of Indore. It is headquarters for the shops of the Great Indian Peninsula Railroad. Pop. (1921) 25,557.

Bhutan, bo͞o-tän', or Bhotan, an independent state in the Eastern Himalayas, bounded on the north by Tibet, on the east by Assam, on the south by Bengal, and on the west by Sikkim. It is traversed by many lofty mountains. The elephant, bear, wild boar and rhinoceros are found in its forests. Manufactures comprise coarse woollen and cotton goods, and tanned buffalo leather. Buddhism of a very simple form is the prevailing faith. The government of Bhutan resembles that of Tibet, the supreme authority being divided between the Deb Raja, or the secular head, and the Dharm Raja, or the spiritual head of the state. The Bhutanese are a hardy and industrious race, but poor and oppressed. The chief towns are Punakha, the winter capital, and Tasichozong, the summer capital.

Bhuvaneswar, bo͞o-v*a*-nes'-wur, the temple city of Siva, Bengal Presidency, India; in the district of Puri. It was the capital of the Kesari or Lion dynasty of Orissa (500–1104 A.D.) and contains the ruins of five or six hundred shrines.

Biafra, bē-äf'r*a*, Bight of, large and deeply indented bay on the west coast of Africa, between the mouth of the Niger and Cape Lopez (400 miles). It receives the Niger, Old Calabar (Cross and Calabar), Rio del Rey, and other rivers. Fernando Po, Prince's, and St. Thomas are the principal islands.

Biala, byä'lä, town, Poland, 30 miles southeast of Warsaw. The chief industries are hemp growing, cattle-rearing, and tanneries. Pop. (1921) 12,966.

Bialystok, byäl'e-stok', town, Poland, in Bialystok County, on the Bialy River; 120 miles northeast of Warsaw. The leading industries are soap, hats, leather and woollen goods manufacture. Pop. 77,000.

Biana, byä'nä, town, Rajputana, India, in Bhartpur state; 50 miles southwest of Agra. It is one of the oldest towns in India and is a sacred spot to the Mohammedans. Pop. (1921) 6,954.

Biancavilla, byäng-kä-vēl'lä, town, Sicily, in the province of Catania, on the southwestern slope of Mt. Etna; 19 miles northwest of Catania. Lava paves many of the streets. The leading industries are cotton manufacture and wine production. Pop. 15,000.

Bianchini, byäng-kē'nē, Francesco (1662–1729), Italian astronomer, was born in Verona. He is remembered chiefly for his tracing of the meridian. He founded the Academy of the Alethophili ('lovers of truth') in 1686, and was chosen by Pope Alexander viii. secretary of the committee for the reformation of the calendar. His published works include *Istoria Universale* (1697) and various memoirs and dissertations.

Bianco, byäng'kō, or Biancho, Andrea, Italian cartographer, was born in Venice early in the 15th century. He left a collection of hydrographical charts, in one of which, dated 1436, two islands are placed to the west of the Azores, and named Antillia and De laman Satanaxio. This fact has been regarded as indicating a knowledge of the Americas prior to Columbus' voyages.

Biard, byär, François (1798–1882), French painter, was born in Lyons. He was destined for the Church but gave it up to follow an artistic career. His subjects were derived from travels in various lands, as Syria and Egypt (1833), Gold Coast of Africa, Greenland and Spitzbergen (1839), and Brazil (1858). He excels in comic and burlesque situations, as *Les saltimbanques, Après un bal masqué, Un concert de famille.* Of his Greenland sketches the best known is *A Struggle with Bears,* now in the municipal gallery of Leipzig.

Biarritz, byä-rēts (Basque 'the two rocks'), famous winter and summer seaside resort, France, in the department of Basse-Pyrénées, on the Bay of Biscay; 493 miles southwest of Paris and 16 miles from the Spanish frontier. The climate is mild and delightful, and the beach, divided by two rocks into three parts, is especially fine. A magnificent promenade extends along the shore and there is a casino, with saline baths. The castle, built by Empress Eugénie, was burned down in 1886, and its site is occupied by the Hôtel du Palais. Napoleon iii. and his family did much to make the place famous and it was a favorite resort of Edward vii. of England. Pop. (1921) 18,353.

Bias, bī'*a*s (*c.* 550 B.C.), of Priene, in Ionia, was famous as one of the Seven Wise Men of Greece. His reputation seems to have been due to a certain practical wisdom, the fruit of experience rather than of any philosophical system.

Bib, Pout, or Brassy (*Gadus luscus*), a small fish, allied to the haddock, found in the North Sea and the Arctic Ocean, and brought to European markets.

Biban-el-Muluk, bē-bän'el-mū'lo͝ok, valley, Upper Egypt, near the ruins of Thebes. It contains tombs of ancient kings (18th, 19th, and 20th dynasties).

Bibbiena, bēb-byā'nä, Cardinal (1470–1520), Italian prelate and comic writer, whose real name was Bernardo Dovizio, but who was generally called Bibbiena, from his birthplace. He was made cardinal (1513) by Leo x., whose secretary he had long been, and became a great patron of art and learning. He is the author of what is generally regarded as the earliest regular Italian comedy, the *Calandria*, which, though not acted till 1513 and not printed till 1521 (at Siena), appears to have been written about 1490. It is based on the *Menæchmi* of Plautus, and borrows numerous traits from Boccaccio's *Calandrino*. Though remarkable for indecency even in that age of loose morals, it is still prized by reason of its natural dialogue, sparkling wit, and admirable prose.

Bibescu, PRINCE DIMITRIE. See STIRBEY, BARBO.

Bibiri. See GREENHEART.

Bible. ***Language and Text of Old Testament.***—The Old Testament, omitting the Apocrypha, is written in Hebrew, with the exception of the following portions, which are written in Aramaic, a kindred Semitic language: Dan. ii. 4-vii. 28; Ezra iv. 8–vi. 18, vii. 12–26, and a single verse of Jeremiah (x: 11). No MS. of the Old Testament is reckoned to be earlier than the 9th century A.D., and it has been thought that those MSS. which are extant are all descendants of a common ancestor not earlier than the 2nd century A.D. We have, however, two sources of evidence which are of great value—the *Targums* and the *Versions*. An interpretation became necessary as soon as the sacred books were read in a language which had ceased to be the ordinary speech of the people. In course of time, as this oral interpretation became more elaborate and stereotyped, it was reduced to writing; and these written Targums are among our most valuable helps, both for fixing the text as read in the Jewish synagogues, and for determining the interpretation which the Jews attached to difficult passages. But it is upon the *Versions*, or translations made from the Hebrew in early times, that we chiefly depend both for the determination of the true text and for its explanation. Following is an account of various versions.

1. *Greek Versions.*—Of these by far the most important is the *Septuagint*, which was produced in Egypt from about 300 B.C. to 150 B.C. As a translation it is of unequal excellence, but as it is the oldest translation of the Hebrew Bible, and as all the other early translations are made from it, with the exception of the Peshito Syriac and Jerome's Vulgate, its study is of prime importance. It is constantly quoted by the writers of the New Testament. The remaining Greek versions belong to a later date, and the translators of them are better known. They were collected in the first half of the 3rd century by the great Christian scholar Origen, in the work he called the *Hexapla* (or sixfold), on account of the six columns into which each page was divided; and these six columns contained:

1. Hebrew text.	2. Hebrew text in Greek letters.
3. Translation of Aquila.	4. Translation of Symmachus.
5. Translation of the Seventy (the Septuagint)	6. Translation of Theodotion.

If this work of Origen had come down to us, we should have had three Greek translations to compare with the Septuagint. Unfortunately, there is nothing preserved beyond a number of quotations. Of the translators mentioned, Aquila was a Jewish proselyte from Pontus, who wrote in the beginning of the 2nd century. He was a very literal translator, and aimed at rendering even the untranslatable Hebrew particles. Theodotion was also a Jewish proselyte, from Ephesus; he aimed at reforming the text of the Septuagint, and his rendering of Daniel was accepted by the Church as superior to that of the Seventy. His date is somewhere in the latter half of the 2nd century. Symmachus, a Samaritan Ebionite, belongs to the end of the 2nd century.

2. *Syriac Versions.*—The principal Syriac version, the Peshito (which means either *simple* or *vulgate*), was made (2nd century) direct from the Hebrew, with occasional reference to the Septuagint. There is also another Syriac version made direct from the Septuagint as it stood in the Hexapla of Origen, hence called the *Hexaplar* (616–618 A.D.).

3. *Latin Version.*—The Old Latin, or *Itala*, was a literal translation of the Septuagint, made in the 2nd century, A.D. The *Vulgate* is in the New Testament the revision of this, in the Old a translation of the Hebrew, made by Jerome in Bethlehem between the years 392 and 404 A.D. To fit himself for this work Jerome acquired the Hebrew somewhat late in life. The work of revision is very unequally done: some books underwent very little change; others were much more carefully treated. In particular the Psalter had already been twice revised by him on the basis of the Septuagint; these revisions are known respectively as the Roman and Gallican Psalters.

4. Other ancient versions—such as the *Arabic*, the *Persian*, and the *Ethiopic*—are of less value.

The Canon of the Old Testament.—The whole collection of books contained in the Bible is usually spoken of as the Canon, or canonical Scripture, any single book being said to be in the canon, or canonical. Before Origen's time, the truth recognized by the Church had come to be spoken of as the canon or test of doctrine; and the books that were in accordance with the traditional rule of faith, and embodied it, were therefore said by Origen to be canonized or canonical. But since the Scriptures themselves contain in written form this standard of faith, they themselves came to be spoken of, in an active sense, as the canon, or rule by which other books or statements might be tested.

It is probable that in Israel the first religious documents were collections of laws to be used by the priests in the instruction of the people, and records of events which had influenced the national consciousness. Later on, the prophets, or their amanuenses, wrote down the discourses they had delivered in God's name. But the first approximation to what we call the canon seems to have been the law-book, believed to have been Deuteronomy, found in the temple in the reign of Josiah (2 Kings xxii, xxiii), which was immediately acknowledged by king, prophets, priests, and people as an authoritative record of religious law. It cannot be determined when the other elements of the Pentateuch were composed, but it would seem that all the parts were gathered in one collection by Ezra between 444 and 400 B.C., and accepted by the people as an exhaustive record of the *Law* (*Torah*), the first great division of the canon. But by this time the chief historical books were written, as well as the greater part of the prophetical books; and precisely to such books the attention of the thinking part of the nation turned for knowledge of the past history, and for instruction and consolation in their present position. Accordingly, we find that the books which, in the Hebrew Bible, immediately follow the Pentateuch are the books of Joshua, Judges Samuel, and Kings, which give a connected history of the nation from the death of Moses to the Babylonian captivity; and then, with the exception of Daniel follow all the books which we call prophetical.

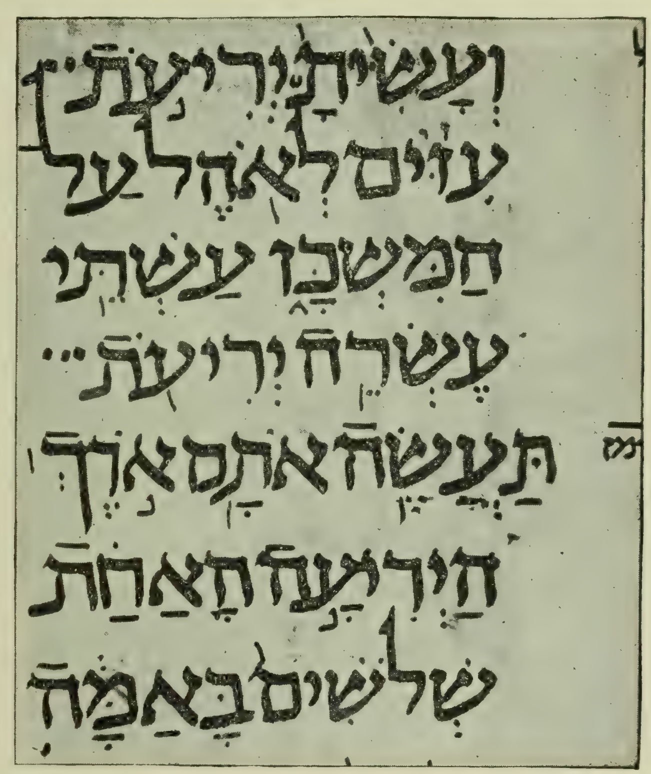
This addition to the national religious literature became known as the *Prophets*, for even the historical books were written in a prophetic spirit. They must have been written after the time of Malachi (who was somewhat later than

Nehemiah), and probably a considerable time later, and when there was no longer any hope of other prophetical books being written. At all events, the earliest available notices on the subject speak of the Law and the Prophets together, or give clear indication that the prophetical books were then in the canon. After a time, though it is impossible to fix a date for the beginning of the practice, it was customary to read parts of the prophetical Scriptures in the stated worship, a section being assigned to accompany the lesson of the Law for the day. Finally, after the Law and the Prophets had been thus joined together, there remained a considerable number of books, some of which are certainly earlier in date than some of the books that had been included. These remaining works have a more diversified character than either of the classes of Law and Prophecy, and they have never received a more definite designation than *Kethubim*, or 'writings,' and we usually apply to them the equivalent Greek name of *Hagiographa*, or 'sacred writings.' We find them referred to in the book of Ecclesiasticus (Prologue) as 'the other books that follow' the Law and the Prophets, or simply as 'the rest of the books.'

The canon, thus completed, containing precisely the books now found in the Old Testament, was, according to the Talmud, ratified by the Council of Jamnia (or Jabneel, between Joppa and Ashdod), *c.* 90 A.D. The three great divisions, frequently referred to in the New Testament, in varying phraseology, mark the three stages by which the collection assumed its final form. The total number of books, according to Jewish enumeration, is twenty-four, so that the whole Hebrew Bible is sometimes spoken of as 'the four and twenty.' The divisions and the enumeration are exhibited in the following table:—

	Books.
I. Law, *i.e.*, the Pentateuch, or five books from Genesis to Deuteronomy . . .	5
II. Prophets—	
1. Former prophets: Joshua, Judges, Samuel, Kings .	4
2. Latter prophets: Isaiah, Jeremiah, Ezekiel, and the Twelve	4
III. Writings—	
1. Three poetical books: Psalms, Proverbs, Job .	3
2. Five rolls: Song of Songs, Ruth, Lamentations, Ecclesiastes, Esther . .	5
3. Three books: Daniel, Ezra-Nehemiah, Chronicles .	3
	24

The 'former prophets' are so called simply from their position, not from any assumption of their date. As already explained, they are historical books; and it is to be noted that Samuel and Kings are reckoned each as one book; for these books, as well as Chronicles and Ezra-Nehemiah, were not divided by the Jews till the 16th Christian century. Among the latter prophets, the 'Twelve,' which are now usually termed minor prophets, have always gone together and been reckoned as one book, owing to their limited compass, which admitted of their being written on one roll. The three books, Psalms, Proverbs, and Job, are taken together and provided with a special system of accentual marks for cantillation. It is misleading to speak of them as *the* poetical books, for some of the other books—*e.g.* The Song of Songs and Lamentations—have an equal claim to the title, and many portions of the prophetical books are in the form of poetry.



ועשית יריעת
עזים לאהל על
המשכן עשתי
עשרה יריעת
תעשה אתם ארך
היריעה האחת
שלשים באמה

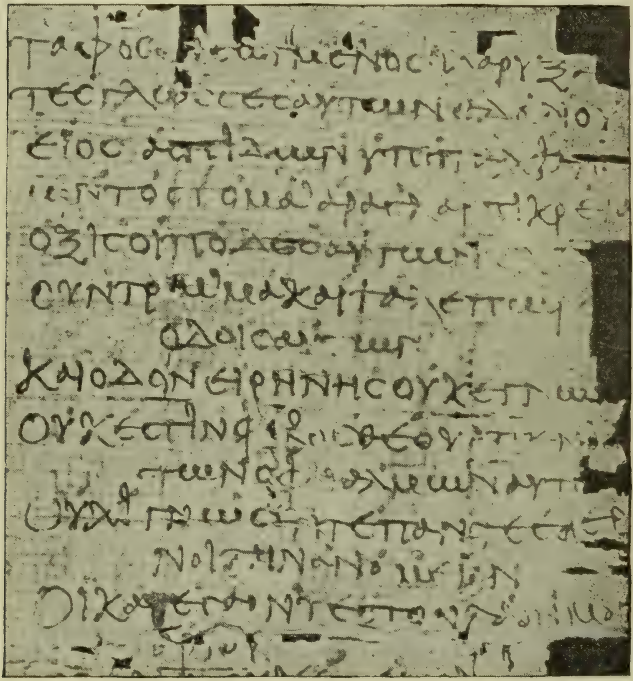
Portion of Manuscript (Exod. 26:7) in Square Hebrew.

(Earliest dated Hebrew MS. in the British Museum.)

The 'five rolls' are so denominated because each was written on a roll by itself, and they came to be associated with, and publicly read at, five great sacred seasons. Daniel, though a prophetical or rather apocalyptical book, does not come with the other prophets; the most probable explanation being that it did not exist, at least in its present form, when the other prophetical books were included in the canon.

Connection between the Testaments.—Between the last Old Testament writing and the rise of the New Testament literature there intervened about one hundred and fifty years. Although this period is a blank so far as contributions to the canonical Scriptures are concerned, there was really no cessation in the literary activity of the people. But the religious productions of this time, though indispensable for the history of Judaism, and not without value for devotional purposes, manifest neither the lofty genius of the preceding literature, nor the inspired glow of that which was to follow. For this and for other reasons, not the least being that they were (mainly) written in Greek, the Jews never invested them with canonical dignity. They are known as the Apocrypha of the Old Testament. The

Greek fathers, as also Augustine, seem to draw but little distinction between these apocryphal writings and the accepted Scriptures, and the Council of Trent put them alongside of the Old Testament and New Testament as 'sacred and canonical'; but the reformed churches have usually regarded them as of lower rank. Their merit, particularly for purposes of edification, was not denied—was, indeed, in the modern confessions, generally asserted—and they were until the beginning of the 19th century bound up with the Bible, though the use of them as sources of doctrine was held to be illegitimate.



Fragment of Psalter, from Septuagint (Ps. 11:7 ff.).

(Earliest MS. of any portion of the Bible known to be in existence. Written on papyrus, in uncial, in third century. Found in Egypt, 1892; now in British Museum.)

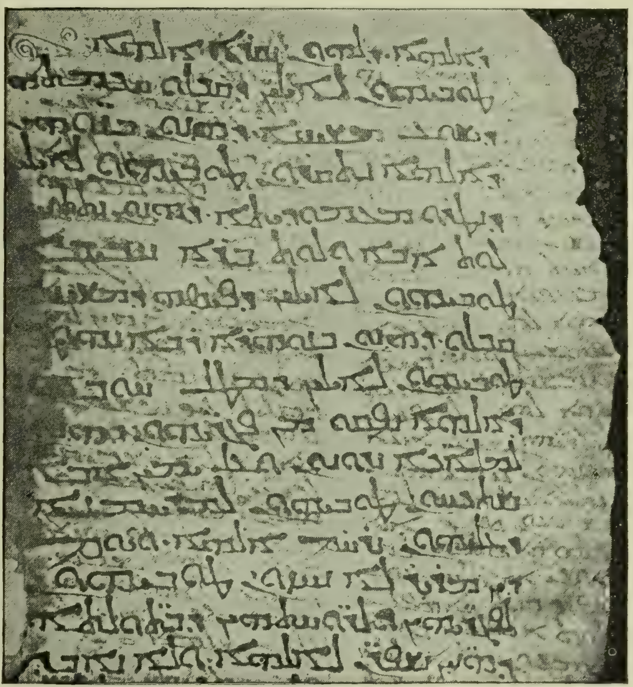
The New Testament.—The New Testament is a collection of twenty-seven distinct writings, from eight (or more) different hands. The books are usually classed as Historical (five), Didactic (twenty-one), Prophetical (one), though the writings of the first class include much more than one-half of the entire matter. The unity of the whole is remarkable: all the books find their centre in Jesus Christ. The four gospels narrate His life on earth; the fifth historical book tells how the new life, that came from Him through the Holy Spirit, passed from Jerusalem to Rome. The epistles, written by men of varied personal character and temperament, among whom by far the most prominent and the most fertile was the apostle Paul, set forth the significance of the gospel facts as revealed to them according to our Lord's promise (John 16:12,13). The single prophetical book (the Revelation of St. John, or the Apocalypse), however it is to be interpreted, shows the Lamb as King, to become victor on earth, where His church is preparing through conflict to share His triumph. In our English Bible the order of these writings is not chronological. In ancient MSS. there was much variation in position; the seven general epistles were usually placed immediately after Acts, the gospels coming first, though not always in the order now universal. The Pauline epistles seem to have been arranged according to length, so that the earliest and the latest stand together (1 and 2 Thess., with 1 and 2 Tim. and Titus). There is evidence in these writings of an advance of Christian thought towards maturity; but the progress is along divergent lines, nor can all the books be classified according to assumed types of doctrine. Biblical theology properly discusses the theology of the several writings; but the theology of the New Testament is one, whatever progress is discernible. Moreover, the advance in St. Paul's teaching, as indicated by a comparison of Thessalonians with Ephesians, is almost as marked as that between the general epistles of St. James and St. John, which are regarded as presenting the respective extremes in the progress of doctrine. The gospels cannot be classified by any such principle; for while that of St. John, from its purpose, presents the most mature statements, there is no appreciable advance in doctrine from St. Matthew to St. Luke. The same Lord Jesus Christ was apprehended by all the writers in substantially the same way. See also GOSPELS and PAUL.

Language and Text of the New Testament.—The New Testament is written entirely in the Greek language. The existence of a number of various readings in the text of the New Testament necessitates an inquiry into the materials from which the text is derived, and into the causes which have produced the divergent readings. Most of these divergences are mere trifles, caused by careless copying and insufficient correction. The materials of textual criticism are usually reckoned under the heads of Copies, Versions, and Fathers, which might be grouped as—(1) Copies + Patristic Citations from Copies; (2) Versions + Patristic Citations from Versions. For convenience the books are grouped under the heads of Gospels, Acts and Catholic Epistles, Pauline Epistles, and Apocalypse; and the enumeration of MSS. is made *de novo* with each group. Sometimes this is indicated by writing a few letters above the sign representing the MS., as D^{Paul}, E^{Act}, or by adding a subscript numeral, as D_2, E_2. Only a few fragments of the New Testament exist written on papyrus. It is, however, almost certain that that was the primitive material on which the apostolic documents were written (*cf.* 2 John 12: 'I did not wish to write with paper and ink'). Of MSS. written on vellum, the most important are those belonging to the 4th, 5th, and 6th centuries, which pass under the name of the 'Five Great Uncials.' They are as follows:—1. א (Aleph; 4th century)—the Codex Sinaiticus, discovered by Tischendorf in 1844 (and 1859), in the monastery of St. Catherine, on Mt. Sinai. The greater part of this MS. is now in St. Petersburg. It contains the whole of the New Testament complete, together with the Epistle of Barnabas, and a large part of the Shepherd of Hermas. The last twelve verses of Mark are wanting; but it is suspicious that the page where they should occur appears to be a cancel. 2. B (Vaticanus; 4th century) is in the Vatican Library at Rome. It contains the New Testament as far as the middle of Heb. 9:14; but the rest of Hebrews, as well as the Pastoral Epistles and the Apocalypse, are wanting. א and B probably proceeded from a common workshop, perhaps the library at Cæsarea; and this may explain why both lack the last twelve verses of Mark. 3. A (Alexandrinus; 5th century) is now in the British Museum. There seems no reason to doubt the tradition which assigns to it Alexandria. This MS. contains the whole New Testament, the first Epistle of Clement and a part of the second Epistle. 4. C (Ephræmi Syri rescriptus; 5th century) derives its name from the fact that the original text of its Greek Bible was washed out in the 12th century, in order to make room for a Greek translation of some works of St. Ephrem the Syrian. The MS. is now in Paris, but almost nothing is known of its origin and history. About three-fifths of the New Testament have been recovered from its pages. 5. D (Codex Bezæ; 6th century) derives its name from Beza the reformer, who presented it in 1581 to the University of Cambridge, in whose public library it is exposed to view. This MS. is a bilingual, containing, besides the Greek text of the Gospels and Acts, a parallel Latin version of great antiquity. The whole number of Uncial MSS. known to the critical world is estimated at something over 120; but in this enumeration a number of MSS. are counted more than once. The Cursive MSS. are, as might be expected on account of their later dates, much more numerous; probably we might set their number at between 2,400 and 2,500 (the numeration being repeated for the different groups of books as before). Of all this number only a very few have been rendered available for criticism by exact collation; a fact which is much to be regretted, as there are preserved in Cursive MSS. many rare and curious readings which are of great antiquity, and yet have no attestation in Uncial MSS. It is not meant that all Cursive MSS. deserve complete and exhaustive collation, but most of them merit more careful study than they have hitherto received. It is also to be admitted that they are, relatively to the Uncial MSS. and the versions, of much less value in the determination of the text. But we must bear in mind that the texts of Cursive MSS. are merely the descendants of lost Uncial MSS., and that the maxim that 'all various readings are early' applies to them as well as to the more imposing Uncial MSS. Where a number of Cursive MSS. can be proved to come from a common lost original, it is often possible to restore the lost (Uncial) ancestor by a critical comparison of the texts that are descended from it.

A word must be said in passing of *Lectionaries*, or copies of the Gospels, or the Acts and Epistles, arranged for reading in churches. They are very numerous, and almost unknown as to text; but enough is known to enable us to affirm with certainty that they often contain fragments of very early texts. When the lectionary is made up out of lessons from the Gospels, it is commonly called an *Evangelistarium;* when the lessons are taken from the Acts and Epistles, it is known as an *Apostolos* or *Praxapostolos* or *Epistolarium.*

We come now to *Versions*, a class of witnesses to which greater weight is continually being assigned in the determination of the text. The great value of the versions lies in the evidence which they furnish as to the state of the New Testament text at the time when it was translated, though it must be borne in mind that, as they are only copies in a foreign language, they are subject to the same changes and accidents as are ordinary Greek MSS. We may divide the earliest versions into the following groups:—1. SYRIAC VERSIONS; 2. LATIN VERSIONS; 3. EGYPTIAN VERSIONS.

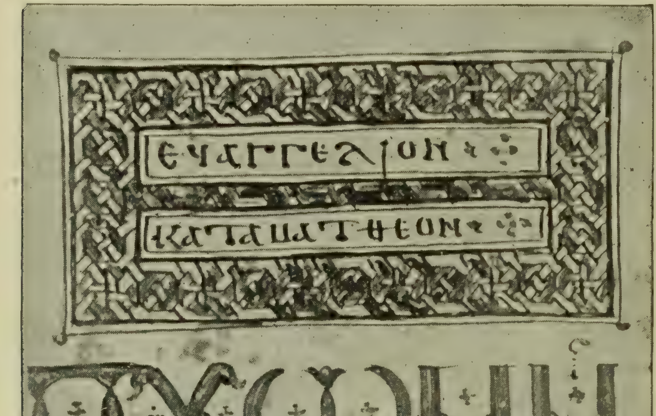
Each of these versions is believed to go back in some form to the 2nd century; and this may be taken as proved for the first two groups. The third group has not yet been adequately studied.



Portion of Manuscript in Syriac (Luke 7:44-47).
(Found in the convent of Sinai by Mrs. Lewis, 1892.)

1. SYRIAC VERSIONS.—The Syriac New Testament is known to us in the following forms:—(1.) *Old Syriac* (Lewis's Syriac) from Mt. Sinai, discovered in palimpsests in 1892 by Mrs. Lewis. (2.) *Old Syriac*, from the Nitrian Desert (commonly called Cureton's Syriac, after its discoverer, who detected it amongst the treasures brought from the Syrian convent in the Nitrian Desert to the British Museum). This is so nearly the same text with the Sinai version, that they must stand in some close genealogical relation. (3.)

Tatian's Harmony of the Four Gospels must be considered with the two foregoing versions; for although it is not extant in the original Syriac, but only in Armenian, and in Arabic versions derived from it, yet is it certain that it was in close agreement with the old Syriac version. (4.) The *Peshito* is the next stage in the history of the version. This is a revision of the Old Syriac in order to bring it into closer agreement with the Greek text, as well as, no doubt, to improve the diction and clear it of harsh or ungrammatical forms. The result of the revision is a version of such beauty that it has been often called the queen of the versions. (5.) The *Philoxenian Syriac* is a Syriac version, made apparently in the interests of literal translation for Philoxenus of Mabug in 508 A.D. Its first form appears to have been lost, but we possess it in a later recension made by Thomas of Heraclea in 616 A.D. From him it is often known as the Harklean or Heraclean version. (6.) The *Jerusalem* or *Palestinian Syriac*. The history of this version is still a problem, but enough of the text has come to light to show that it is in very close connection with the Tatian Harmony and with the Old Syriac, as well as with many of the best Greek MSS.



Portion of Matthew's Gospel (ch. 1) in Coptic.

2. The Latin Version is known to us in a variety of forms, of which the principal are as follows:—(1.) *Old Latin*, an African version made in the 2nd century. (2.) The *Vulgate*. The Old Latin was revised by Jerome during the last quarter of the 4th century, and this revision, known as the Vulgate, is to-day the final authority of the whole Roman Catholic Church.

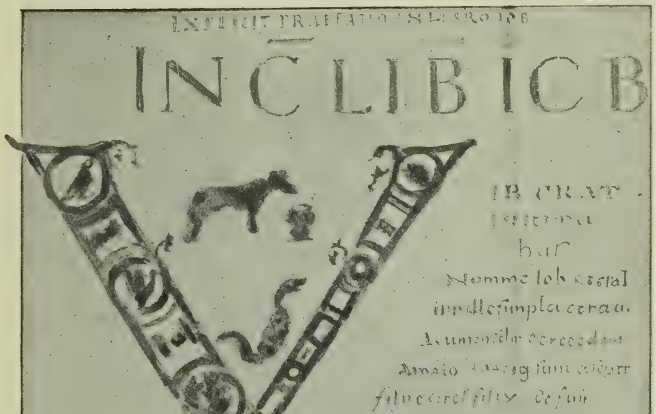
3. The Egyptian New Testament appears in a number of translations and dialects, of which the chief are:—(1.) The Coptic or Memphitic version of Lower Egypt, sometimes called Bohairic (3rd to 4th century). (2.) The Thebaic or Sahidic version of Upper Egypt, slightly later than the Memphitic. (3.) The Fayyûm version, of which fragments have recently been recovered.

Besides the above there are the *Ethiopic*, connected with the Egyptian; the *Armenian*, derived from the Syriac; the *Gothic* (Ulphilas); the *Arabic;* the *Slavonic*, etc.

The Fathers.—As already said, the Greek copies of the New Testament, as well as the versions made from the Greek, derive collateral confirmation from the citations made by the fathers of the church. And here we have the advantage that almost every quotation made by a patristic writer is a dated landmark in the history of the text; so that from a study of Origen's works we recover large portions of the MSS. which he used in the 3rd century, and so on. But we are as yet only at the beginning of the studies which would enable us to make proper use of such valuable material.

New Testament Canon.—Previous to the middle of the 2nd century after Christ, the church found its final authority in the scriptures of the Old Testament and in the words of Jesus. Various gospels were already in circulation, and there seems to have existed also a large mass of oral tradition regarding the teaching and work of Jesus; and both written and verbal material was used as the source of information and doctrine. But the apostles having been long dead, as also most of those who had known them, the church began to feel the need of a better defined and a more stable standard of religious truth. This was found in the four gospels, Matthew, Mark, Luke, and John; these accordingly were declared to have authority as Scripture, and to be worthy of co-ordination with the Old Testament. This canon of the gospels had received such universal recognition before the close of the 2nd century, that Irenæus is found giving reasons why it should consist precisely of *four*. The second stage, the canonization of the epistles, etc., followed almost immediately, though many years elapsed ere the church reached unanimity regarding some of them. The conditioning circumstance of the rise of an accredited collection of the epistles was the spread of heresy, particularly of Gnosticism, within the church. To combat this it was found necessary to make appeal to the apostolic teaching regarding Christ, and as this had, unsystematically but with wonderful fullness, been set forth in letters, etc., from various men of apostolic standing, a collection of these was made, and their regulative character declared. Considerable doubts existed at first about the admission of certain books—*e.g.* Hebrews, the Apocalypse, and some of the smaller epistles—as it was questioned whether these were from apostolic hands; but by A.D. 200 something like unanimity was reached; and the New Testament nearly as we have it became the accepted standard of the whole church.

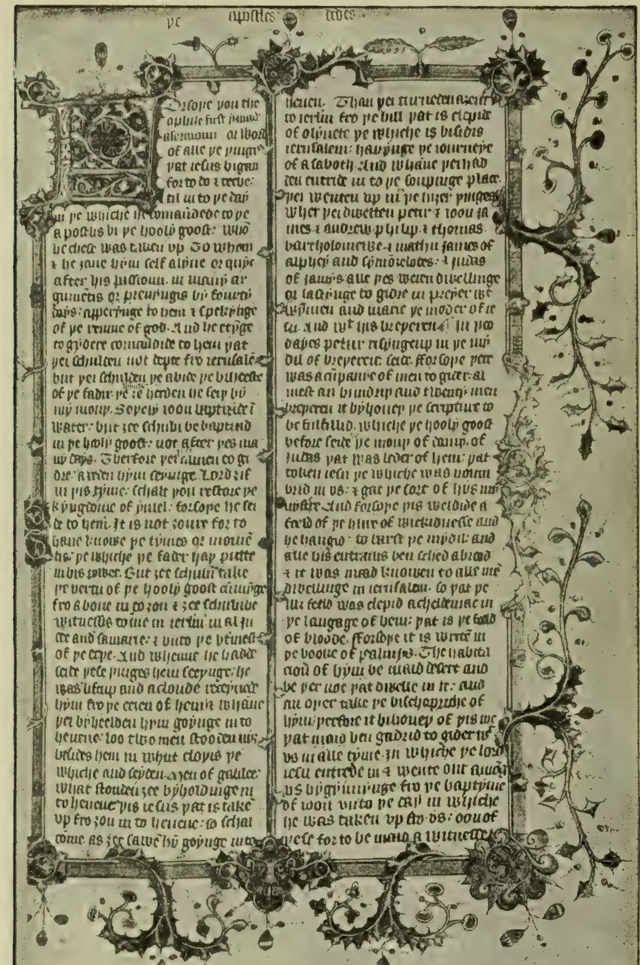
The English Bible.—Portions of Scripture were translated into Anglo-Saxon as early as the 8th century, but the first complete rendering into what may be called English was made by Wycliffe about 1382. It is, however, to Wm. Tyndale that we owe the first printed Testament, issued at Worms in 1525. Tyndale translated also the Pentateuch, printed in 1530. The first *complete* printed English Bible was that of Miles Coverdale, a folio volume of the highest bibliographical value, printed in 1535, probably at Zürich, and based upon the Swiss-German edition (6 vols. Zürich, 1527–9). Next we have Matthew's Bible (1537), which largely utilizes the versions of Tyndale and Coverdale. Taverner's Bible was printed in London in 1539, whole as a folio, in parts as a quarto, that the poor might purchase portions of the Bible. The Great Bible (so named from the large size of its pages) was prepared at the suggestion of Cromwell, Earl of Essex, and finally issued from London in 1539. The Geneva Bible (often called the 'Breeches Bible,' from its rendering of Gen. 3:7), the work of Wm. Whittingham and others, with notes of a distinctly, even aggressively, Calvinistic trend, was issued in 1560, and was held in high favor for three-quarters of a century thereafter. The Bishops' Bible (called also the 'Treacle Bible,' from its translation of Jer. 8:22) was executed, as a kind of offset to the last named, under the supervision of Archbishop Parker, and published in 1568. Then came the Catholic Rheims New Testament (1582) and the Douay Old Testament (1609). But meanwhile, in consequence of the Hampton Court Conference of 1604, the preparation of what is now known as the Authorized Version was in progress. The Bishops' Bible was adopted as its basis, but most of the above-named translations, particularly the Rheims and the Geneva, were made use of, and the work was finally given to the public in 1611. This edition has exercised an outstanding influence on English thought and literature, and might well have been considered final, had not the recent science of textual criticism shown that its Greek original was itself frequently unsound. This fact, together with the admitted want of uniformity in its language, led scholars to propose a further revision; and when the House of Convocation in 1870 sanctioned the proposal, steps were immediately taken to carry it out. Scholars representing widely different sections of the church were invited to take part in the work, and at length, in 1881, the Revised New Testament was issued, the Old Testament following four years later. Interesting particulars regarding the methods and labors of the revisers are given in the published prefaces to their work.



The Latin Bible, St. Jerome's Version (Vulgate)—Job I.

(Written in 840 A. D., with gold and silver initials. Now in British Museum.)

Of Bibles printed in America the following are the most noteworthy. The Eliot Bible, translated by John Eliot for the Indians of Massachusetts; the New Testament appeared 1661, the complete Bible, 1663, 2d ed., 1685. A Bible for the Germans of Pennsylvania, repeating Luther's version, was printed by Dr. C. Saur in Germantown, 1743. The first Bible in the English language printed in America was the Aitken Bible, Philadelphia, 1782, the only copy known being in the British Museum. An edition of the Douay version appeared in Philadelphia, 1790, 4to. In Worcester, Mass., the first folio and royal quarto Bible was printed by Isaiah Thomas, 1791, the same year as that of the Collins Bible, Trenton, N. J. Charles Thomson published at Philadelphia the first American translation of the Septuagint, 1808.



Wycliffe's Bible (*Brit. Museum*)—'*the Apostles' Dedes.*' (*Acts ch. i.*)

In 1851 Jas. Murdock issued a translation of the Syriac New Testament in New York. The American Bible Union has published many editions of its translations, having its renderings conformed to the views of the Baptists on the method of administering that rite. Most noteworthy of all is *The American Standard Revised Bible*, published in 1901 (copyright, Thomas Nelson and Sons). It is the latest revision of the Bible in English. The American revisers who collaborated with the British revisers made a large number of emendations, which were not incorporated in the text of the English revision, but were published as an appendix which formed part of every copy issued during a term of fourteen years from the date of publication. Immediately after the publication of the English Revised Version, the English Revision Committee disbanded; but the American Committee kept up their organization. It was felt that the Bible of 1885 was a British product, that the services and scholarship of the American committee had not been sufficiently recognized, and that the completed work was unsatisfactory. This committee therefore continued, throughout the whole period of fourteen years, to revise not only the appendix, but the entire Bible, making use of the rich contributions made during the entire period of the sciences of linguistics, archæology, and textual criticism, and in 1901 this new version (the *American Standard*) was published. The charter of the American Bible Society was amended in order to enable it to publish this version. A noteworthy enterprise is that of Dr. Haupt of Johns Hopkins, at the head of an informal association of scholars in England, Germany and the United States, to produce *The Sacred Books of the Old and New Testaments* with the sources printed on a background of different colors. This is known officially as *The Polychrome Bible*, popularly and unofficially as the 'Rainbow Bible.' The object is first to produce a more critical text than is at the basis of the Revised Version, and next to render that into pure but not obsolete English. Mr. H. H. Furness is the editor for expression in English. Several books have already appeared, the first part having been published in 1898.

The Twentieth Century New Testament (Horace Marshall and Sons, 1904) is a translation into modern English from the text of Westcott and Hort. Several Bibles are published expressly for children's reading.

Bible Publishing.—The right to publish the King James Version in England is vested in the King's Printers (Eyre and Spottiswoode) and the Universities of Oxford and Cambridge. Other publishers must obtain a license (granted gratuitously) and conform to certain regulations of the Bible Board. The issue of Bibles in Scotland is authorized under license of a similar Bible Board for Scotland. In America there are no restrictions on the publishing of the Bible, which is largely done by the American Bible Society.

Translations into other modern languages have become too numerous even for mention here. They have been to a large extent the work of the agents of the British and Foreign Bible Society. The history of Bible translation in the chief European languages runs parallel to that of the English Bible. One of the finest of modern renderings, comparable in its literary and religious influence to the English Authorized Version alone, is Luther's German Bible (1534). A revision by a company of scholars, under the leadership of E. Kautzsch, was published 1896. Excellent translations exist also in Dutch (authorized by the Synod of Dort, 1637), Swedish (1774), Danish (1607, revised 1647), French (by Olivetan, 1545, revised by Calvin and by Beza), and other languages, but the history of some of these is, from want of contemporary evidence, often difficult to trace.

Literature.—The literature in all departments of Biblical study is enormous, and additions are constantly being made. Germany, perhaps, takes the lead in productivity, but England (with America) has been making giant strides of late. We can only indicate a few of the most prominent or most accessible books. General.—Bible Dictionaries by Smith, Hastings, and Cheyne and Black. The *King's Printers' Aids*, the Cambridge *Companion*, and Nelson's *Bible Treasury* are useful to non-professional students. Introduction.—Old Testament: Driver, C. H. H. Wright (with excellent bibliographies), Cornill (Ger.); New Testament: Moffat (*Historical New Testament*), Dods, Weiss (trans.), Holtzmann, Jülicher (Ger.). Commentaries. — *International Critical Commentary* (O.T. and N.T., appearing), Cambridge Bible for Schools, vols. in Clark's Handbooks for Bible Classes, Temple Bible (including Apocrypha), Century Bible (N.T. complete). Concise German.—*Kurzer Hand-Commentar zum Alten Testament* (issuing), and *Hand-Commentar zum Neuen Testament* (Holtzmann, Schmiedel, Von Soden, etc.). Theology.—Schultz (O.T. trans.); Beyschlag (N. T. trans.); G. B. Stevens. Canon.—Ryle, Wildeboer, Buhl (both trans. O. T.), Reuss (N. T. trans.). Original Text.—Hebrew: Van der Hooght, Baer-Delitzsch, Sacred Books of the O.T. (appearing); Greek: Westcott and Hort, Revisers' Text. Textual Criticism.—Buhl, T. H. Weir (O.T.); Hammond, Scrivener, Tischendorf-Caspari (N.T.).

Bible Christians. See Methodists.

Bible Communists. See Perfectionists.

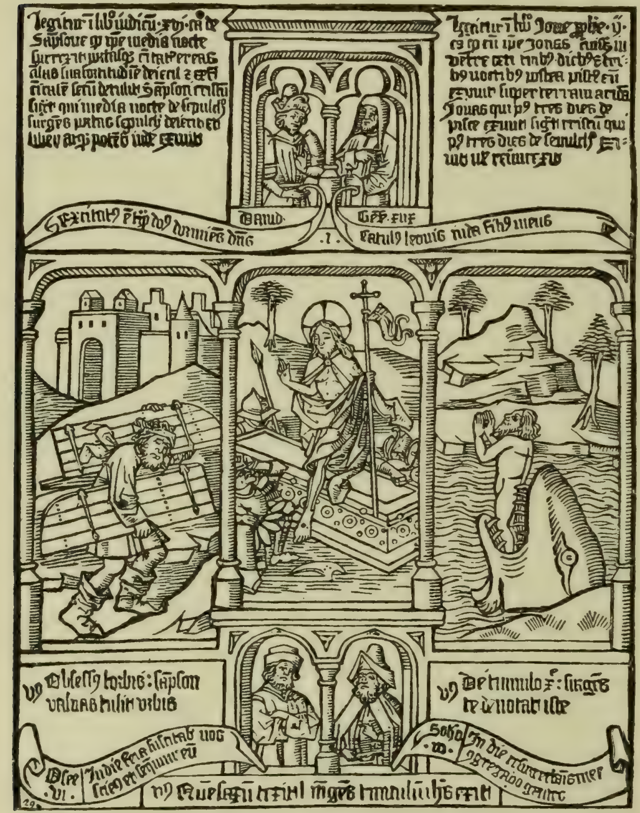
Bible Societies, societies formed for the printing and distribution of the Bible. Their characteristics are that they are voluntary associations, non-ecclesiastical, non-sectarian, Protestant, and benevolent. The first Bible Society was the Canstein Bible Institute, in the Orphans' Home in Halle, founded by the Marquis of Canstein in 1710, which distributed, before 1719, 40,600 Bibles and 100,000 New Testaments. In the year 1879 the copies printed by the institute had reached the enormous number of 6,100,000. In 1780 was formed in London The Bible Society, which subsequently changed its title to the Naval and Military Bible Society. It confines its operations to the naval and military service of the United Kingdom. The British and Foreign Bible Society was founded in 1804, with the object of encouraging a wider dispersion of the Scriptures both at home and abroad, the first year's subscriptions reaching £5,600. Similar societies were formed on the Continent, at Basel (1804), Berlin and Regensburg (1805), with two in Africa, five in Asia, and others in Nova Scotia, Canada, and the W. Indies. Other continental societies were formed as follows: The Russian, 1813, suppressed in 1826, another still active was founded 1869; the Swedish, 1814; the Danish, same year; that of the United Netherlands, 1815; the Norwegian, 1816; the Protestant Bible Society of Paris, 1818. The British and Foreign Bible Society is the largest in the world. It has 1,200 auxiliaries and branches, with upwards of 3,000 Bible associations in connection, mainly conducted by women. The National Bible Society of Scotland is the result of the union of all the Scotch organizations, which had been working independently since 1827, but which united in 1861. It has issued since that time more than eleven million copies or portions of the Scriptures.

The American Bible Society was the result of a concerted movement by a number of existing societies. The earliest of these were organized in Philadelphia, 1808, Hartford, Conn., Boston, New York, and Princeton, N. J., 1809. In 1816 delegates from thirty-five societies, those just mentioned among them, met in New York and organized the American Bible Society, to which the societies already existing became auxiliary. With this and the British and Foreign Bible Societies some 16,000 smaller societies are affiliated.

In 1836 the American and Foreign Bible Society was founded in New York by the Baptist denomination, 'to endeavor to ascertain the exact meaning of the original text of the Bible, to express that meaning as literally as the nature of the languages into which they should translate the Bible would permit, and to transfer no words which were capable of being literally translated.' In 1850 the American Bible Union was formed—a society which was instituted with the object of publishing revised versions of the Bible in conformity with the principles of the Baptists that the word βαπτίζειν should be translated 'to immerse.' With this exception, the various Bible societies have worked in harmony with each other. See J. Owen's *Hist. of the Brit. and Foreign Bible Society* (1816); *Jubilee Memorial of British and Foreign Bible Society* (1854); J. Brown, *Hist. of the British and Foreign Bible Society* (1859); W. Canton, *History of the British and Foreign Bible Society* (1904), and *The Story of the Bible Society* (1904); W. P. Strickland's *Hist. of American Bible Society* (1856); *Jubilee Memorial* (1866); *Manual of the American Bible Society* (1877).

Biblia Pauperum, or Poor Men's Bible, the name given by modern writers to a series of MSS. and printed books containing illustrations of events in the life of Christ, with the corresponding Old Testament prefigurements or types, and a small amount of explanatory text in rhyming Latin verse. As early as 1181, fifteen subjects from the life of Christ, each with two Old Testament parallels, were executed in enamels on an antipendium, or altar-front, in the Leopold Chapel of Klosterneuburg in Austria. The earliest known MS. containing this triple arrangement dates from the beginning of the 14th century, and is preserved at St. Florian, Austria. The text, as well as the pictures, was cut in wood, and the books contain from thirty to forty leaves, printed on one side only. There have been several reproductions (*e.g.*, London, 1884, with introduction by Dean Stanley). See Heinecken's *Idée Générale d'une Collection d'Estampes* (1771), in which the fantastic name *Biblia Pauperum* was first used; Sotheby's *Principia Typographica* (1858); Schreiber's *Manuel de l'Amateur de la Gravure* (1891–95); and an article by Sir E. M. Thompson, 'On a Manuscript of the Biblia Pauperum,' in *Bibliographica*, vol. iii. (1897). See also Block-books.

Bibliography. Derived from the Greek βιβλιογραφία, which means 'the writing of books,' and used in the 17th century in England in this sense, the word bibliography was reintroduced in the early years of the 19th century to denote the writing, not of books, but about books, and this in two different shades of meaning which correspond roughly with their form and their matter. One school of bibliographers, whose interests are reflected in the publications of the Bibliographical Society, which has its headquarters in London, the Edinburgh Bibliographical Society, etc., the Grolier Club of New York, etc., concerns itself chiefly with the accidents of the production of books—*e.g.* the history of handwriting, of printing, bookbinding, paper-making, bookselling, publishing, book illustrations, book-collecting, book plates, book stamps, and kindred topics. Information on each of these subjects is given under its own heading. No very good general treatises on them exist, but reference may be made to the publications of the societies already named, to numerous periodicals (mostly short-lived), such as the *Bookworm* (1888–94), the *Library* (begun in 1889), *Bibliographica* (1895–7), *Le Livre* (1880–9), *La Bibliographe Moderne* (begun in 1897), *Zeitschrift für Bücherfreunde* (1897); and to such works as E. Rouveyre's *Connaissances Nécessaires à un Bibliophile* (5th ed. 1899), *The Library*, by Andrew Lang (1893), and *The Printed Book*, translated from the French of Henri Bouchot by E. C. Bigmore (1890). The titles and descriptions, with notes of former prices (now quite out of date), of a large number of books which collectors value for various reasons, will be found in Brunet's *Manuel du Libraire et de l'Amateur des Livres* (5th ed. 1860–80), Graesse's *Trésor de Livres Rares et Precieux* (1850–69), and in Lowndes's *Bibliographer's Manual of Eng. Lit.*, these being chiefly English (1857–64); also in the annual volumes of *American Book Prices Current* (annually since 1894) and Slater's *Book Prices Current* (begun in 1887).



Biblia Pauperum. From an example in the British Museum.

In the sense in which it concerns itself chiefly with the matter of books as opposed to their form, bibliography aims at enumerating all the books of a given author or group of authors, or those published in a given period, or in a given country, province, county, or town, or those dealing with any given subject, or such selected books as may be especially useful to students of such subject or subjects. Information as to special bibliographies of this kind will here be found under the articles that deal with the subjects to which they refer, but the following short list of general works may be found useful:—1. Bibliographies of bibliographies.—Petzholdt's *Bibliotheca Bibliographica* (1866); Vallée's *Bibliographie des Bibliographies* (1883–87); Fortescue's *List of Bibliographical Works in the Reading Room of the Brit. Museum* (1889); Stein's *Manuel de Bibliographie Générale* (1897); Ferguson's *Some Aspects of Bibliography* (1900); Josephson's *Bibliography of Bibliographies Chronologically Arranged* (1901). 2. General catalogues.—*General Catalogue of the Brit. Museum Library* (1881, etc.); *Subject Index to the Modern Works added to the Brit. Museum since* 1880 (3 vols. 1902–3;) Sonnenschein's *The Best Books: a Reader's Guide to the Choice of the Best Available Books in every Department of Science, Art, and Literature* (1891, 1895). 3. National bibliographies.—Watt's *Bibliotheca Britannica* (1824); Low's *Brit. Cat.* (1837–52), and *Eng. Cat.* (1864, etc.); S. A. Allibone's *Critical Dict. of Eng. Lit.* (1859; Supplement, 1891, includes both English and American works); Roorbach's *Bibliotheca Americana* (1852–61); Kelly's *American Cat. of Books published in the U. S. from January*, 1861 (1866, etc.); Leypoldt's *The American Cat.* (1880, etc.); *The Publishers' Weekly*, *Publishers' Trade List Annual*, *Monthly Cumulative Book Index* (since 1898); Quérard's *La France Littéraire* (1829–39; Supplement, 1854–64), and *La Littérature Française Contemporaine*(1842–57); Lorenz's *Catalogue de la Librairie Française*, from 1840 (1877, etc.); Heinsius's *Allgemeines Bücher-Lexikon*, from 1700 (1812, etc.); Kayser's *Index Locupletissimus Librorum: Vollständiges Bücher-Lexikon, enthaltend alle von* 1750 *in Deutschland gedruckten Bücher* (1834, etc.).

Bibliomancy, divination by means of opening the Bible and noting the first passage which the eye lights on, or by entering a church and observing the first words of the Bible which are heard. It was in extensive practice for centuries, especially in the case of the election of bishops.

Bibliothèque Nationale, the great library and museum in Paris. The magnificent edifice in which it is now housed was put up under the direction of Labrouste (1854–75). It includes five departments—(1) printed books; (2) manuscripts; (3) prints, etc.; (4) maps; (5) coins and medals. Of printed books there are more than 2,500,000, and the number grows by about 70,000 annually; of MSS. there are more than 100,000; of prints, etc., over 300,000; and of coins and medals, about 200,000.

Bicar'bonate. See CARBONATES.

Bi'ceps ('two-headed'), as generally used, the muscle on the front of the upper arm, which flexes the elbow, and which has two separate attachments above. This is the *biceps flexor cubiti.* The *biceps flexor cruris,* one of the three ham-string muscles, runs the full length of the back of the thigh, and bends the knee.

Bicêtre, bē-sā'tr, suburb of Paris to the southeast. Its castle, built in 1285 by the archbishop of Winchester (whence the name), was rebuilt in the 17th century, and served successively as a hospital for retired soldiers, a prison, a poorhouse, and a lunatic asylum. It is called officially Kremlin-Bicêtre. Pop. 15,000.

Bichat, bē-shå', MARIE FRANÇOIS XAVIER (1771–1802), French anatomist and physiologist, was appointed in 1797 as lecturer on anatomy, surgery, and experimental physiology, and in 1800 as physician at the Hôtel-Dieu. He did much to systematize the study of anatomy and physiology, and published: *Recherches physiologiques sur la vie et la mort* (1800); *Anatomie générale, appliquée à la physiologie et à la médicine* (1801); *Traité des membranes.*

Bichir. See POLYPTERUS.

Bichloride of Mercury. See CORROSIVE SUBLIMATE.

Bichromate Cell. See CELL, VOLTAIC.

Bick'erstaff, ISAAC, a pseudonym used by Dean Swift when he burlesqued Partridge, the almanac-maker, in 1709. Steele also used the name, in the *Tatler.*

Bickerstaffe, ISAAC (*c.* 1735–1812), Irish dramatist. His most successful works were *Love in a Village* (1762), a comic opera; and *Maid of the Mill* (1765), an after-piece.

Bickerstaffe-Drew, COUNT FRANCIS BROWNING DREW (1858–), English Roman Catholic prelate and author, was born in Headingly, Leeds, and was ordained priest in 1884. He was acting chaplain (1886–92) and chaplain (1892–9) to the Forces at Plymouth; Roman Catholic chaplain at Malta (1899–1905); private chamberlain to Pope Leo XIII. (1891) and of Pope Pius X. (1903). In 1904 he was created domestic prelate to the Pope. He served in the Great War (1914–15). Under the pseudonym 'John Ayscough' he wrote: *Marotz* (1908); *Dromina* (1909); *Faustula* (1912); *Gracechurch* (1913); *Monksbridge* (1914); *French Windows* (1917); *Jacqueline* (1918); *Abbotscourt* (1919); *First Impressions in America* (1921); *Pages from the Past* (1922); *Dobachi* (1923).

Bick'more, ALBERT SMITH (1839–1914), American naturalist, was born in St. George, Knox county, Me. He was graduated from Dartmouth College (1860) and from 1860 to 1864 worked under Prof. Louis Agassiz at Harvard. From 1865 to 1868 he was engaged in travels in the East Indies, China, Siberia, and Japan, of which he published an account entitled *Travels in the East Indian Archipelago* (1869). He was for one year professor of natural history in Madison University (now Colgate), and in 1869 became superintendent of the American Museum of Natural History at New York. In 1884 he was made professor in the newly established department of public instruction there, and in 1904 became professor emeritus.

Bicycle. See CYCLING.

Bida, bē'dä, town, West Africa, in the British Colony and Protectorate of Nigeria (Northern Provinces), 20 miles from the left bank of the Niger. It is the capital of the native kingdom of Nupe. Pop. about 50,000.

Bidar, bē'dur, town, Haidarabad, India, 72 miles northwest of Haidarabad. It is noted for its metal ware of silver inlaid on iron. Pop. about 13,000.

Bidassoa, bē-dä-sō'ä, a small stream entering the Bay of Biscay, divides France from Spain where the main line railway and road cross the frontier at Hendaye (Irun). On the Isle of Pheasants, in mid-stream, the treaty of the Pyrenees was signed (1659) between France and Spain.

Bid'deford, city, Maine, York county, on the Saco River, 9 miles from its mouth, and on the Boston and Maine Railroad; 18 miles southwest of Portland. It has a public library and hospital, a fine beach, and boating and fishing facilities. Water power is developed from the falls in the river, and supplies cotton, woollen, and lumber mills. According to the Federal Census for 1919 industrial establishments number 49 with $18,714,699 capital, and products valued at $20,634,401. In the vicinity are great quarries of fine granite, the product of which is an important export. Biddeford was first settled in 1630; it took its present name in 1718. Pop. (1900) 16,145; (1910) 17,079; (1920) 18,008.

Bidding Prayer, a formula of public prayer, contained in the oldest Greek, Gallican, and English liturgies, in which the priest details what the congregation is to pray for, ending with the Lord's Prayer. In the canons of 1603 it is laid down that the bidding prayer shall be used before every sermon, lecture, or homily. A collect is now generally substituted; but in cathedrals, at university sermons, and in charitable and other foundations, distinctive bidding prayers are used regularly. Consult Dearmer's *Everyman's History of the Prayer Book.*

Bid'dle, CLEMENT (1740–1814), American soldier, was born, of Quaker descent, in Philadelphia, Pa. He headed a company of Quakers, 1764, in defence of some friendly Indians who had sought refuge in Philadelphia from a band of rowdies. He resisted the working of the Stamp Act, 1765, and in 1775 helped organize the Quaker company of volunteers formed in Philadelphia. He was elected deputy-quartermaster of the 'flying camp' of volunteers by Congress, 1776, and served in the Revolution until 1780. After the war Washington appointed him U. S. marshal of Pennsylvania, and he was subsequently quartermaster-general of the same State, in which capacity he helped suppress the 'whiskey insurrection' of 1794.

Biddle, JAMES (1783–1848), American naval officer, was born in Philadelphia, Pa., and entered the navy as midshipman, 1800. He was captured and held prisoner at the time the *Philadelphia* ran aground off Tripoli, 1803, and was engaged in several notable sea-fights in the *Wasp* and *Hornet* during the War of 1812, for which he was awarded a gold medal by Congress. He took possession of Oregon for the United States, 1817, negotiated a commercial treaty with Turkey, 1826, and the first treaty of the United States with China, 1845.

Biddle, JOHN (1615–62), 'the Father of English Unitarianism,' was the son of a tailor of Wotton-under-Edge, Gloucestershire. A close study of the Scriptures led him to reject the doctrine of the Trinity, and he was summoned before the authorities for heresy. He made a somewhat unsatisfactory confession of faith at that time, but later (1645) published *Twelve Arguments against the Deity of the Holy Spirit.* From that date much of his life was spent in prison. In 1648, despite an ordinance inflicting the death penalty upon Unitarians, he issued his *Confession of Faith touching the Holy Trinity according to Scripture,* and soon afterward his *Testimonies* of the early fathers. He used his freedom under the Act of Oblivion, 1652, to produce his *Twofold Catechism,* for which he again suffered imprisonment. In 1662 he died in prison. Consult *Life* by Toulmin.

Biddle, NICHOLAS (1786–1844), American financier, was born in Philadelphia, Pa. He was graduated from Princeton (1801), was secretary of legation at Paris and London (1804–6), and conducted important government financial transactions in the former city. He served occasional terms in the Pennsylvania legislature, and having been instrumental in rechartering the United States bank, was appointed (1819) by President Monroe government director of that institution, succeeding in 1836 to its presidency, a position which he held until President Jackson's attack upon the bank brought about his resignation in 1839, and the bank's failure in 1841. He labored for many years in behalf of the common-school system eventually introduced in Pennsylvania in 1836. He was associate editor (with Joseph Dennie) and editor of the *Portfolio*, a literary magazine, 1806–23, and edited Lewis and Clark's *Report* of their expedition to explore the territory acquired through the Louisiana purchase.

Bid'eford, seaport town, England, in Devonshire, near the mouth of the Torridge, 8½ miles southwest of Barnstaple. It has potteries, shipyards, and sail lofts. It was the birthplace of Sir Richard Grenville (of Tennyson's *Revenge*), and here Kingsley wrote part of his *Westward Ho!* Pop. (1921) 9,125.

Bi'dens, a genus of composite plants found in wet soil, or swamps, throughout the United States. Some of them have bright yellow sunflower-like heads, and are known as Bur Marigolds, or Tickseed Sunflowers (*B. lævis* and *B. trichosperma*), while others are rayless, like *B. connata*, the Swamp Beggar-tick, and *B. frondosa*, the Stick-tight. One species, *B. Beckii*, the Water Marigold, is aquatic, its submerged leaves being divided into many capillary segments, and its golden-rayed flower borne above the surface of the water. The achenes of some species (such as *B. connata* and *B. discoidea*) are flat, thin, and wedge-shaped, having at the upper corners long, downwardly barbed awns, which attach the seed to the clothing, whence they are known as Beggar-ticks. The plants of *Bidens* are commonly tall and rank, with generally opposite leaves, sometimes much lobed and divided; they bloom in late summer and autumn.

Bidpai, bid'pī, otherwise Pilpay, Baidaba, and Sendebar, the reputed author of a collection of apologues, known as *The Fables of Bidpai*. The name, however, is probably a title of honor rather than a proper name. The original collection of tales is not now in existence, but parts are contained in the *Panchatantra*, the *Mahábhárata* and the *Hitopadesa* (qq. v.). Of the Indian original, the classical Arabic version, *Kalilah wa Dimnah* (c. 750 A.D.) is a reproduction, founded on the Pahlavi translation of the Persian physician Barzoi (about 570). An incomplete old Syriac version, dating also from about 570, was discovered in the episcopal library at Mardin, and published in 1876 by Bickell with an introduction by Benfey. This work as it exists is made up of three elements, Indian, Persian, and Arabic, three chapters being Persian, and six appearing first in the Arabic version, while twelve chapters are of Indian and Buddhist origin. Of these last, five correspond to the five chapters composing the Panchatantra, two appear in the first book thereof, three are found in the Mahábhárata, and two seem to have fallen out of the Indian literature altogether. The Jatakas or 'Birth Stories' of Buddha inculcate the same teaching and morals as the Fables of Bilpai, which would indicate that Buddhism was probably their source and inspiration. In the fables animals are endowed with human powers and often give voice to shrewd and clever bits of wisdom. Of English translations there have been twenty since the latter part of the 18th century, the earliest being that by Sir Thomas North, made in 1570 from the Italian version of 1552 by Antonio Doni. In 1888 this was reprinted, with a scholarly introduction by Joseph Jacobs.

Biebrich, bē'bri*ch*, or Biebrich-Mosbach, town in the Prussian province of Hesse-Nassau, on the right bank of the Rhine, 3 miles south of Wiesbaden. It has a grand-ducal palace (1704–6). There are iron foundries and manufactures of soap, gypsum, and aniline dyes. Pop. (1910) 21,194.

Biel, bēl, (Fr. *Bienne*), town, Switzerland, in the canton of Bern, at the northern end of the Lake of Biel or Bienne; 21 miles northwest of Bern. It is attractively situated at the foot of the Jura mountains and is connected by funicular roads with the mountain health resorts of Evilard and Malcolin. There is a Technical Institute and the Museum Schwab contains many interesting antiquities. Biel has manufactures of watches, leather, jewelry, and cotton goods. Pop. (1920) 34,599.

Biela, bē'lä, Wilhelm, Baron von (1782–1856), German astronomer, was born in Rossla, Prussia, near Stalberg, in the Harz Mountains. He entered the Austrian army (1805), but devoted his leisure to the study of astronomy, and discovered, on Feb. 28, 1826, the comet to which his name was given. Its period is between six and seven years, about 6.6 years, and its reappearance was observed in 1832, 1846, and 1852; since then it has not appeared, but its course has been marked by brilliant meteoric displays on several of the dates at which it was expected.

Bielaya, byel'ä, river of Russia, rising in the Ural mountains, in Orenburg government. It flows first southwest, then north and northwest, and after a course of nearly 500 miles, empties into the Kama.

Bielaya-Tserkov, byel'ä-yä-tser'kof, (Pol. *Bialacerkiew*), town, Kiev, Ukraine, 30 miles southwest of Vasilkov, on an affluent of the Dnieper. It has trade in grain, cattle, and beer. Pushkin immortalized it in his *Poltava*. The population numbers about 21,000.

Bielefeld, bē'l*e*-felt, town, Germany, in Westphalia, at the foot of the Teutoburger Forest; 35 miles southeast of Osnabrück. The most notable buildings are the Altstäder Kirche, with a fine 16th century altar, the Neustädter Kirche, with two 14th century tombs, and the Sparenburg castle, built in the 12th century and restored in 1877. Bielefeld is the centre of the Westphalian linen industry and has manufactures also of damask, plush, glass, sewing machines, and cement. Pop. (1919) 79,049.

Bielgorod, byel'gō-rot, or Belgorod ('White City'—'Belgrad'), town and archiepiscopal see, Russia, in Kursk government, on the right bank of the Donetz, 90 miles south of Kursk. Agriculture is well developed; tanning and brewing are carried on, and there are manufactures of soap, candles, bricks, and leather. Pop. about 23,000.

Bielitz, bē'lits, town, Czechoslovakia, close to the Polish border; 45 miles northeast of Freiberg. It is the centre of an important woollen industry and has a large export trade. There are also manufactures of machinery, nails, glass, and paper. Pop. 18,580.

Biella, byel'lä, town and episcopal see, Italy, in the province of Novara, 30 miles northwest of Vercelli. It has a ninth century cathedral and manufactures textiles. Pop. (1911) 22,519.

Bielo-ozero, byel'ō-ō'zye-rō ('White Lake'), lake, Russia, in Novgorod government. It is 20 miles wide, 27 miles long, and has a total area of more than 430 square miles. It is drained by the Sheksna into the Volga, and is connected by canal with Lake Onega. The ancient town of Bielozersk stands on the south shore.

Bielopol, byel'o-pôl', or Byelopolye, town, Russia, in Kharkov government; 170 miles by rail east of Kiev. It has distilleries, brickworks, and tanneries, and trade in grain and cattle. It was founded in 1672. Pop. 15,300.

Bielostok, byel-o-stôk', or Byelostok (Pol. *Bialystok*), town, Poland, on the Biala, a subaffluent of the Vistula, 50 miles by rail southwest of Grodno city. Rapidly growing industrial centre: cloth, silk, hat, and other manufactories; grain and wood trade. Scene of a terrible massacre of Jews in 1906. Pop. 80,000.

Bielski, byel′ski, Martin (1495–1576), Polish historian, the first to write history in the Polish language. Chief works: *Kronika Sviata*, or *Universal History* (1550); *Kronika Polska*, or *History of Poland* (1597), continued and published by his son Joachim.

Bieltsi, byel′tsi, Bieltzy, or Beltsi, town, Bessarabia, Russia, 85 miles northwest of Kishinev, on the railway line from Czernowitz to Odessa. Manufacture of bricks, soap, and candles; horse and cattle trade. Annexed 1812. Pop. 20,000.

Bien-Hoa, bi-en-hō′ä, capital of the arrondissement of Bien-Hoa, in Lower Cochin-China, on the Don-naï, emptying into the China Sea; 14 miles northeast of Saigon. It has manufactures of furniture. Pop. 20,000.

Bienne, Switzerland. See Biel.

Bien′nials, in gardening, are strictly flowering plants that do not flower until the year following that in which they emerge from their seed coverings, and do not live beyond the year in which they first flower. But the length of time which elapses between the birth and death of a plant is largely a matter of climate, and a plant which is biennial in certain climates is sometimes merely annual when grown in a climate with a longer summer. The gardener uses the words with a somewhat wider meaning, for often he includes as biennials all those plants which are at their best in the year following the sowing of the seed, though, strictly, many of them are annuals or perennials (qq. v.).

The most familiar example of a biennial is perhaps the common Foxglove (*Digitalis*). Many cultivated plants are biennials, as the Carrot, Turnip, Parsnip, Parsley, Celery, etc.; and many of the most esteemed flowers of our gardens, as Hollyhocks, Mulleins, Campanulas (certain species and varieties), Sweet Williams, Chinese Pinks, Wallflowers, Biennial Stocks, Rockets, some of the Evening Primroses, Honesty, and Sweet Scabious.

Bienville, byañ′vēl′, Jean Baptiste le Moyne (1680–1768), born in Montreal, Canada, son of Charles le Moyne, one of the famous four brothers so conspicuous in early French exploration and settlement. See Le Moyne.

Bierce, bērs, Ambrose (1842), American author, was born in Ohio. He was a line officer in the Civil War, and was brevetted major for distinguished services. He was editor of the *Argonaut* and *Wasp* (1877–84), and contributed to various periodicals in London and California, including *Fun*, *The Overland Monthly*, and the San Francisco *Examiner*. His published works are: *Cobwebs from an Empty Skull* (1874); *The Monk and the Hangman's Daughter* (1892); *Black Beetles in Amber* (1892); *Can Such Things Be?* (1893); *In the Midst of Life* (1898); *Fantastic Fables* (1899); *Shapes of Clay* (1903); *The Cynic's Word Book* (1906); *The Shadow on the Dial, and Other Essays* (1909); *Write It Right* (1909). His Collected Works were published in 1912.

Bierley, North, parish in Shipley division, 2 miles southeast of Bradford, West Riding, Yorkshire, England. It has coal mines and iron works. Pop. (1911) 22,130.

Bier's Congestion Treatment. In recent years this method of treatment, introduced by the distinguished surgeon, August Bier of Bonn, has attracted considerable attention. The basis of the treatment is the production of obstructive hyperæmia, brought about usually by the application of a tight rubber bandage to the part, the bandage being applied above the part where the hyperæmia is desired. The continual congestion leads to improved nutrition of the part; a process of reactive inflammation is set up, which inhibits the action of, or destroys outright, the bacteria in the diseased joint or tissues below the constricted part. The obstruction to the flow of venous blood must not be so great as to block the lymphatic return; it must suffice only to produce a hyperæmia in which the skin is uniformly red. The patient should not experience any pain or discomfort from the treatment.

There are three methods employed—(1) the constriction bandage; (2) the suction apparatus; (3) the employment of hot air.

Bierstadt, bēr′shtät, Albert (1830–1902), American painter, was born in Düsseldorf, Germany, and was brought to America when an infant. Developing a taste for art, he went abroad, studied at Düsseldorf and Rome, and returned to settle in New York City (1857). He became a National Academician, and a member of the National Institute of Arts and Letters. He chiefly devoted himself to representation of the scenery of the Western United States. His works include: *Lander's Peak in the Rocky Mountains* (1863); *North Fork of the Platte* (1864); *Valley of the Yosemite* (1866); *Eruption of Vesuvius* (1868); *Valley of Kern's River* (1875); *Discovery of the Hudson River* (Capitol at Washington).

Biesbosch, bēs′bos′ (*i.e.*, 'rush bush' or 'rush land'), a district of the Netherlands, lying between the provinces of South Holland and North Brabant. It consists of an intricate agglomeration of islands, waterways, and marshes, some 70 to 80 square miles in extent, and originated in consequence of the bursting of a dam in the Maas in 1421. About one-half of the land then overwhelmed by the waters has since been reclaimed.

Bifrost, bēf′rost, or Asbro, in Scandinavian mythology, the bridge between earth and heaven over which the gods daily pass to Doomstead, the hall of the Fates or Norns, and the judgment seat under the mystic ash tree Yggdrasil. The keeper of the bridge is Heimdall. The rainbow is the evident origin of the myth.

Big′amy, in modern law, consists in the contraction of a second marriage while a pre-existing one remains undissolved. Strictly speaking, *bigamy* means having two wives (or husbands), *polygamy* (q. v.) having more than two, at the same time. Under the canon law, the term bigamy signified marrying more than one wife or husband, whether the first was still alive or already dead, or marrying one who had been already married—*e.g.*, a widow. The canonist also added two other kinds of bigamy—interpretative and similitudinary, the first of which consisted in marriage with a woman who, though not married, had had illicit intercourse with another man as a harlot or otherwise; and the second, marriage by one who was considered already married in a spiritual sense, that is, by one who was in holy orders, or had taken a vow of chastity.

The English and American law on the subject is founded on a rigorous statute of 1603. The modern English law is set forth in a statute of 1861, reproducing an older act of 1829, and its provisions may be taken as generally holding good in the United States also. The light in which this statute views the offence is as an injury to the person of the second wife. The cases in which it is not an offence to marry a second time during the life of the other spouse are (1) when the second marriage has been contracted abroad (unless in virtue of some special statutory rule); (2) if the other spouse has been absent for seven years and is *bona fide* believed to be dead, but not when the spouse contracting the marriage had the means of ascertaining whether the other was alive and failed to make inquiries; (3) if the marriage has been dissolved by divorce, pronounced by a court of competent jurisdiction, and *a fortiori* if it has been declared null and void from the beginning.

In England it has been held

that the first marriage must be a monogamous one, and such as would entitle the offspring to succeed to real estate. Thus a man who has contracted a Mormon marriage, which does not bind him to monogamy, cannot be convicted of bigamy if he marries again. This is not the law in the United States, however. Further, it is no defence for the accused to plead polygamy as part of his religious creed. It is not necessary to establish a charge of bigamy that the second marriage should be a perfectly valid one. The punishments meted out to bigamists differ throughout the United States. Congress has declared the offence a misdemeanor within the Territories and places within the exclusive jurisdiction of the United States.

See Marriage; Nullity of Marriage; Divorce.

Big Ben, an immense bell weighing 13½ tons in the Westminster Clock Tower, London, England, was cast by George Mears in 1858.

Big Beth'el, village between the York and James Rivers, Virginia, the scene of one of the early struggles of the Civil War. Here Gen. E. W. Pierce with 2,500 Federals attacked 1,800 Confederates, stationed as an outpost of Magruder's camp at Yorktown, but was compelled to retire with the loss of 76 men (June 10, 1861).

Big Black River, rises in Webster county, Mississippi, flows in a general southwesterly direction, and enters the Mississippi River at Grand Gulf. Length, 260 miles.

Big Black River, a tributary of the Porcupine River, Alaska, into which it flows just before the latter enters the Yukon, near Fort Yukon.

Big Black River, flows into Lake Winnipeg, Canada, from the east.

Big Blue River, rises in Nebraska, flows south, dividing Riley and Pottawatomie counties, and joins the Kansas River at Manhattan. Length, including branches, about 300 miles.

Big Brother Movement, a movement founded in 1904, in New York City, by Ernest K. Coulter. The basic idea is similar to that underlying juvenile probation (see Probation), the object being to supplement the work of salaried probation officers by volunteer workers, each one of whom shall play the part of a big brother and adviser to some unfortunate boy. The Big Brothers are men in many walks of life, chosen for their good will and for their fitness, by instinct, training, or experience, to deal with boys. The little brothers are mostly the children of the very poor who have been recommended by the children's courts, children's aid societies, social service bureaus, and kindred organizations, or by individuals. Everything that concerns the material and spiritual welfare of the boy comes within the province of the Big Brother. He is urged to visit the boy, become acquainted with his parents, see that he attends school or obtains employment, make it possible for him to receive proper medical and dental attention, encourage him to attend church and Sunday School, and above all take a personal interest in his progress, reporting regularly to the central organization.

Originating with forty men in New York City, the movement has now spread until in more than one hundred cities some form of Big Brother work is carried on by men's clubs, fraternal orders, and other organizations and individuals. Among the agencies cooperating are gymnasiums, industrial classes, and boys' clubs conducted by Y. M. C. A. organizations, churches, and social settlements; hospitals, trade schools, farm schools, the Boy Scouts, and school camps.

The headquarters of the parent organization are at 200 Fifth Ave., New York City. General Secretary, Rowland C. Sheldon.

Big'elow, Frank Hagar (1851), American meteorologist, was born in Concord, Mass. He was graduated from Harvard University (1873), and studied for the Episcopal ministry between terms of service as astronomer at Cordoba Observatory, Argentine Republic (1873–6, 1881–3), receiving the degree B.D. (1880). He was professor of mathematics at Racine College, Wisconsin (1884–9); assistant in the *Nautical Almanac* office (1889–91); professor of meteorology in the U. S. Weather Bureau at Washington (1891–1910); and professor of solar physics at George Washington University (1894–1910). Since 1910 he has been professor of meteorology at the Oficina Meteorologica, Cordoba, Argentine Republic. He has served on various meteorological expeditions and commissions, and has published valuable articles and monographs on meteorological subjects.

Bigelow, John (1817–1911), American author, journalist, and diplomat, was born in Malden, N. Y. He was graduated from Union College in 1835, and was admitted to the bar in 1838. In 1849 he became joint proprietor with William Cullen Bryant of the New York *Evening Post*, of which he was managing editor until 1861. He was U. S. consul-general at Paris (1861–4) and U. S. Minister Plenipotentiary to France (1864–7), rendering valuable service during the trying period of the Civil War. After his return to New York he was appointed (1875) by Governor Tilden a member of the Commission for investigating the New York State Canals, and was subsequently secretary of state for New York (1875–7). For many years he was president of the board of trustees of the New York Public Library. He was a member of the American Academy of Arts and Letters. Among his publications are: *Life of Benjamin Franklin* (1875; the *Autobiography of Franklin*, supplemented by an annotated collection of Franklin's letters); *The Wit and Wisdom of the Haytians* (1877); *Molinos the Quietist* (1882); *France and the Confederate Navy, 1862–8* (1888); *Life of William Cullen Bryant* (1890); *Life of Samuel J. Tilden* (1895); *The Mystery of Sleep* (1896); *Retrospections of an Active Life* (5 vols., 1909–13). He edited the *Writings and Speeches of Samuel J. Tilden* (2 vols., 1885), and the *Complete Works of Benjamin Franklin* (10 vols., 1887–8).

Bigelow, Maurice Alpheus (1872), American biologist and educator, was born in Milford Centre, Ohio. He was graduated from Ohio Wesleyan University (1894), Northwestern University (M.S., 1896), and Harvard (Ph.D., 1901). He has been successively instructor in zoology at Northwestern University (1896–8), and instructor (1899–1903), adjutant professor (1903–07), and professor (since 1907) of biology at Teachers College, Columbia University, where he has been director of the School of Practical Arts since 1914. From 1905 to 1910 he was editor of *Nature Study Review*. His published works include: *Teaching of Zoology in the Secondary School* (1904); *Applied Biology* (with A. N. Bigelow, 1911); *Teachers' Manual of Biology* (1912); *Introduction to Biology* (with A. N. Bigelow, 1913); *Sex Education* (1916).

Bigelow, Melville Madison (1846), American legal writer, was born in Eaton Rapids, Mich. He was graduated from the University of Michigan (1866; LL.B., 1868; A.M., 1871; LL.D., 1912) and from Harvard University (Ph.D., 1879), and took up the practice of law in Boston. He has been lecturer in the law department of the University of Michigan, and in the Northwestern University Law School, and professor and dean of the Boston University Law School. His published works include: *Placita Anglo-Normannica* (1879); *History of English Procedure* (1880); *The Law of Wills* (1898); *The Law of Bills, Notes, and Checks* (second ed., 1900); *The Law of Torts* (eighth ed., 1907); *The Law of Fraudulent Conveyances* (second ed., 1911); *A False Equation—the Problem of the Great Trust* (1911); *The Law of Estoppel* (sixth ed., 1913).

Bigelow, POULTNEY (1855), American author, son of John Bigelow (q. v.), was born in New York City, and received his early education in Germany, France, and the United States. He was graduated from Yale (1879), and in 1882 was admitted to the bar of New York, but after a few years of practice devoted himself to literary work. He has four times circumnavigated the globe in his search for political and sociological data, the first time on board an American clipper, which was wrecked on the Japanese coast. Many of his studies were made on extended canoe trips in the Far East and on the waterways of Europe, and he was the first person to take a canoe through the Iron Gates of the Danube. During the Spanish-American War he was correspondent of the London *Times*.

Poultney Bigelow has lectured extensively on modern history and colonial administration. He is a life member of the more important geographical and historical societies, and is a frequent contributor to contemporary periodicals. Some of his books are: *The German Emperor and His Eastern Neighbors* (1892); *Paddles and Politics Down the Danube* (1892); *The Borderland of Czar and Kaiser* (1894); *White Man's Africa* (1897); *Children of the Nations* (1901); *History of the German Struggle for Liberty* (4 vols., 1896–1905); *Prussian Memories, 1864–1914* (1914).

Big Game Hunting. See HUNTING.

Biggarsberg Mountains, range of South Africa, branching east from the Drakenberg Mountains (q. v.), and separating Newcastle district and the north corner of Natal from the rest of the province.

Big Hatchie River, rises in Northeast Mississippi, and flowing north into Tennessee, enters the Mississippi 40 miles above Memphis. Length, 200 miles.

Bighorn, or ROCKY MOUNTAIN SHEEP (*Ovis canadensis* or *cervina*), a wild sheep of North America, varieties of which occur from Alaska and the shores of the Bering Sea southward as far as Northern Mexico. The typical bighorn stands about thirty-eight inches at the shoulder, with long pointed ears, short hair, and massive horns curving close to the head, with the tips broken, as a rule, and directed forward and upward. The color is usually grayish brown, with a darker dorsal stripe and whitish under parts. The bighorn of the Upper Yukon, Alaska (*O. canadensis dalli*), is pure white.

Big Horn Mountains, a range in Northern Wyoming, part of the Rocky Mountains (q. v.), running in a northwesterly and southeasterly direction, about 180 miles in length. The highest summit, known as Cloud Peak, has an altitude of 13,165 feet.

Big Horn River, rises as Wind River in the Wind River Mountains, Wyoming, and flows nearly north to its junction with the Yellowstone. It is about 450 miles long, and is navigable up to the junction of its chief tributary in Montana, the *Little Big Horn*, in the valley of which occurred the massacre of Gen. George Custer and his troops in 1876. (See CUSTER, GEORGE A.)

Biglow Papers. See LOWELL, JAMES RUSSELL.

Bigno'nia, a genus of American evergreen climbers of the family Bignoniaceæ, which includes also the Catalpa and Tecoma (qq. v.). The bignonias are mostly tropical, and are characterized by a profusion of large, showy flowers. The leaves are opposite, usually compound, and the seeds are winged. Most of the species are grown as hothouse plants.

Bignonia speciosa.

B. capreolata, the Cross Vine, is the only species native to North America. It is a woody vine climbing to a height of 50 feet or more, bearing panicles of large bell-shaped, orange-colored flowers. The stem, when cut transversely, shows a distinct cross. Other species commonly included in the genus are: *B. cherere* or *buccinatoria*, with orange tubular flowers, borne throughout the summer in a cool greenhouse; *B. clematis*, requiring a warm greenhouse, and bearing white and yellow flowers in June and July; *B. speciosa*, requiring a similar temperature, and bearing yellow and lilac bell-shaped flowers in May and June; and *B. venusta*, a stone climber, profusely blooming through autumn and early winter, with long, funnel-shaped corollas of a yellowish crimson.

Big'od, the name of a family founded by a Norman knight, which acquired the earldom of Norfolk in the reign of Stephen. The second earl, Roger, took a prominent part in securing Magna Charta; in 1306 the earldom became extinct.

Bigorre, bē-gôr', former subdivision of Gascony, now the department Hautes-Pyrénées (q. v.), France.

Big Rapids, city, Michigan, county seat of Mecosta county, on the Muskegon River, and the Pere Marquette and Grand Rapids and Indiana Railroads; 55 miles north of Grand Rapids. It is the seat of Ferris Institute. Water power is supplied by the river here, and there are mills, furniture factories, foundries, and machine shops. Pop. (1900) 4,686; (1910) 4,519.

Big Sandy River, also called CHATTERAWAH, is a navigable affluent of the Ohio, formed by the junction of two branches which rise in Virginia. The west fork traverses several counties of Kentucky, and the east fork, during the lower part of its course, is the boundary between the two States. The Big Sandy joins the Ohio at Catlettsburg, Ky.

Big Sioux River, a tributary of the Missouri River. Heading in the northeast part of South Dakota, it flows south, forming the boundary between South Dakota and Iowa in its lower course, and joins the Missouri 2 miles above Sioux City, Ia. Length, about 300 miles.

Big Spring, city, Texas, county seat of Howard county, on the Texas and Pacific Railroad; 270 miles west of Fort Worth. It is the centre of an agricultural, stock raising, and fruit producing district, has salt deposits, and a spring from which it receives its name. Pop. (1910) 4,102.

Big Stone Gap, town, Wise county, Virginia, on the Louisville and Nashville and Virginia and Southwestern Railroads; 175 miles southwest of Charleston. It is in a coal mining district, and has iron manufactures. Pop. (1900) 1,692; (1910) 2,590.

Big Trees. See SEQUOIA.

Bihar, bi-här′, county, Eastern Hungary, bordering on Klausenburg in Transylvania. Area, 4,215 square miles. Pop. 530,000.

Bihar, or Behar, town, Northern India; 36 miles southeast of Patna. It has trade in silk, cotton, and muslin goods. Pop. 45,000.

Bihé, bē-ā′, isolated village and *concelho* on the plateau of Benguella, Angola, Portuguese West Africa, with a climate sufficiently moderate for European settlement, and for the cultivation of corn and other crops of the temperate zone.

Bijanaghur. See VIJAYANAGAR.

Bijapur, bē′*ja*-po͝or, town, Bombay Presidency, India; 245 miles southeast of Bombay. Its mosques and palaces are of great architectural beauty. It was until 1686 the capital of a powerful Mohammedan kingdom. During the early part of the eighteenth century it passed to the Marathas (q. v.), and became British in 1848. Pop. 24,000.

Bijawar, bē-jô′*er*, feudatory state in Bundelkhand, Central India. Area, 974 square miles. Pop. 110,000. Chief town, *Bijawar*, 80 miles southeast of Jhansi.

Bijnaur, bij-nour′, or BIJNOR, the north district of Rohilkhand division, United Provinces, India. Area, 1,875 square miles. *Bijnaur*, the capital, is 45 miles by rail northeast of Meerut. Sugar and cotton cloth are the chief manufactures. Pop. of district, 780,000; of town, 17,500.

Bijouterie, bē-zho͞o′*ter*-i; *F.* bē-zho͞o-t′rē′, articles made of metal (iron, bronze, gold, steel, tin, etc.), intended chiefly for ornamental purposes, and generally set with amber, jet, mother-of-pearl, tortoise shell, coral, pearls, enamel, etc., and even costly jewels.

Bikaner, bik-*a*-nēr′, BIKANIR, or BIKANEER, feudatory state in Rajputana, India. The greater part of the state is a waterless plain. The climate is extreme. Area, 23,311 square miles. Pop. 700,000.

Bikaner, capital of the above state; 240 miles southwest of Delhi. It is surrounded by a battlemented wall 3½ miles in circuit, and contains several Jain monasteries. Pottery, stone cutting, and carving and the making of blankets are industries of the town. Pop. 53,000.

Bikrampur, bik′rum-po͝or, ancient town, Dacca district, Bengal, India. For several centuries the centre of government under the Hindu kings of Bengal, and a seat of learning.

Bilara, town, Rajputana, India; 45 miles southeast of Jodhpur. Pop. 11,000.

Bilaspur, bē-läs′po͝or, or KAHLUR, chief town, Bilaspur district, Central Provinces, India; 250 miles by rail northeast of Nagpur. Pop. 20,000.

Bilbao, bil-bä′ō, city, capital of Vizcaya province, Spain, on the River Nervion; 8 miles from Portugalete at the river's mouth, and 348 miles from Madrid. The city is well built, the principal streets are straight, and the houses are substantial. Five bridges join the Old Town on the right bank of the river with the New Town on the left. Commercially, Bilbao is one of the most important seaports of Northern Spain. It is the centre of a great iron district, and exports large quantities of ore, also pig iron, red wines, and wool. There are docks for shipbuilding, and manufactures of rope, leather, hardware, hats, tobacco, and earthenware.

In the fifteenth century Bilbao was the seat of the most authoritative commercial tribunal in Spain. It suffered severely in the wars with France, in 1795 and 1808. During the Carlist struggles it withstood two sieges, in 1836 and 1874. Pop (1900) 83,306; (1910) 92,514.

Bilberry. See HUCKLEBERRY.

Bilbilis, bil′bi-lis (modern *Calatayud*), town of ancient Spain (*Hispania*), famous as the birthplace of the poet Martial, and for the manufacture of the finest sword-blades and other steel weapons used by the Roman and Carthaginian armies.

Bil′boes, fetters fastened to a bar of iron, carried by the Spanish Armada for using upon the men of the English fleet.

Bilderdijk, bil′*der*-dīk *or* -dīk′, WILLEM (1756–1831), Dutch poet, born at Amsterdam, and studied at Leyden (1780). He practiced law at The Hague till 1786, then went to Germany and England, where he resided some time with Southey. Returning to Holland in 1806, after spending the preceding nine years at Brunswick, he was appointed president of the Institute of Holland by Louis Napoleon; but after the abdication of the latter he left Amsterdam, and settled first at Leyden (1817), and in 1827 at Haarlem, where he died. He left ninety volumes, including an incomplete history of Holland (1832–51). His poems show little originality, though his lyrics are distinguished for mastery of form. The chief are *Buitenleven* ('Rural Life'), *Die Ziekte der Geleerden* ('Maladies of the Learned'), in 1807; and his celebrated epic, *Die Ondergang der Eerste Wareld* ('Destruction of the First World'), in 1809.

Bile is the secretion from the liver, and is discharged into the duodenum. It is a yellow, reddish, or green fluid, its color depending on the proportions of the pigments bilirubin and biliverdin. It is bitter, and either neutral or slightly alkaline; specific gravity, 1.026 to 1.032; the amount secreted daily is from 18 to 36 fluid ounces in the adult. Bile contains certain salts, taurocholate and glycocholate of soda, which are of special service in the emulsification, solution, and diffusion of fatty substances in the food. Bile also acts as an antiseptic, and by increasing the turbidity of the chyme (the form in which food passes down the duodenum) it hinders its progress through the intestine, and so assists absorption. Bile is stored in the gall bladder, whence it is discharged on the passage of food. Drugs which increase the secretion of bile are hepatic stimulants (euonymin, sodium benzoate, etc.); those which act on the bile-expelling mechanism are cholagogues (calomel, etc.).

It has been shown that the bile of venomous serpents, when mixed with their poison, prevents an otherwise fatal dose of the latter from causing death; and the same property is possessed, though in a less degree, by the bile of non-venomous serpents, and by that of all animals.

Calculi, or concretions in the gall bladder or gall duct, are discussed under GALL STONES. See also DIGESTION; LIVER; BLACKWATER FEVER; JAUNDICE.

Bilge (sometimes spelled BULGE) is the part of the bottom of a ship nearest to the keel, and always more nearly horizontal than vertical. A ship usually rests on the keel and one side of the bilge when aground. The name *bilge water* is given to water which finds its way into the bilge or lowest part of a ship, and which, when not drawn off by the pump, becomes dirty and offensive. See SHIPBUILDING.

Bilgram, town, United Provinces, India; 52 miles northwest of Cawnpur. It contains remains of an old fort and temples of Srinagar, built by Sri Ram. Pop. 11,000.

Bilhar′zia, a genus of trematodes or flukes, including in *B. hæmatobius* a dangerous parasite of man, which has been prevalent in Egypt since very early times. It infests the abdominal and urinary blood-vessels, and causes hæmaturia, inflammation, and so on. The exact cause of infection, as in many similar instances, is still uncertain, but it is probable that it occurs through drinking impure water. Both sexes are found within the body of the host, the male carrying the female in a groove or gynæcophoric canal, and the embryos escape with the urine.

Biliary Calculi. See GALL STONES.

Bilimbi. See BLIMBING.

Bilin, bē-lēn′, town and spa in Bohemia, Austria; 15 miles southwest of Aussig. It exports alkaline mineral waters, Bilin pastilles, etc. Fruit is grown, and sugar manufactured. Pop. 9,500.

Bilin River, Burma, flows over 280 miles between the Salwin and the Sittaung to the Gulf of Martaban.

Biliousness, a popular term for a form of gastric duodenal catarrh characterized by nausea, retching, and sickness, with vomiting of bile. It frequently occurs in association with migraine. Treatment consists in one or two days' starvation, rest, and a dose of calomel (3 to 5 grains), followed by a morning saline.

Bill, or BEAK (of birds), consists of an upper and under jaw, clothed in a horny sheath, sometimes undivided and sometimes composed of several pieces. The bill varies greatly in shape and appearance in different groups of birds, and was much relied upon as a diagnostic character in the earlier classification. As striking peculiarities should be noticed the *raptorial* beak of the birds of prey; the flattened bill of the ducks and geese, with its transverse lamellæ, which act as a sifting apparatus; the *fissirostral* beak of swallows, swifts, and goatsuckers, which is short and wide and fringed posteriorly with bristles; the slender (*tenuirostral*) bills of sun birds and others. See BIRDS.

Bill is derived from the Latin *bulla,* 'a seal,' and in its original sense means a document under seal. Documents under the papal seal are called 'bulls.' The word is now used in a variety of senses, both in politics and law.

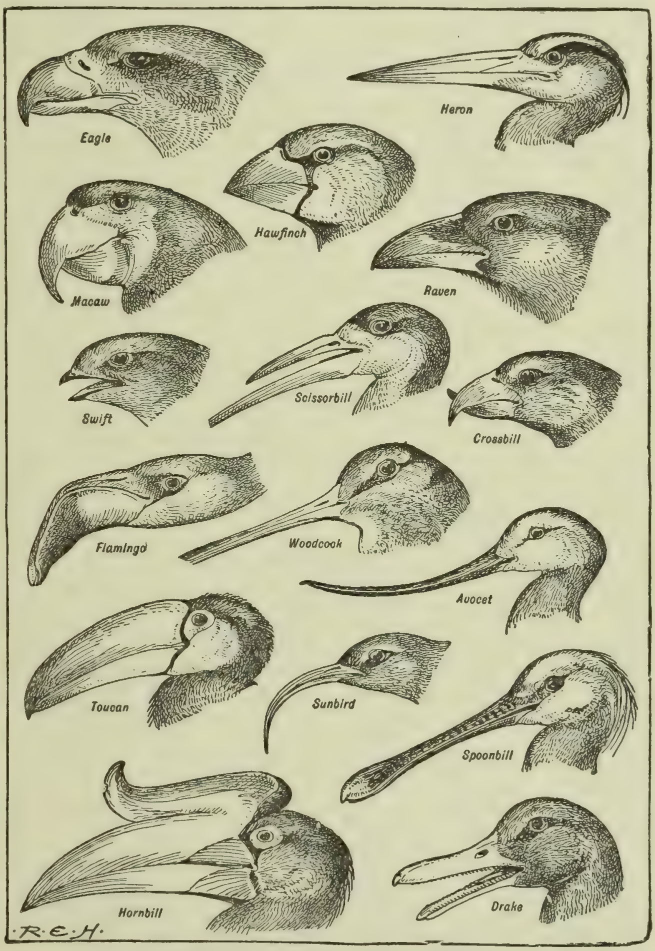
In legislative proceedings, a bill is a formal proposal for legislation properly submitted to a legislative body under its rules. Such legislative proposal retains the name of bill through all the stages of passage or rejection until enacted into law, when it becomes an *act* or *statute.* The term is not applied to motions or resolutions which do not aim at the enactment of laws. (See Act.)

Bill, in equity practice, is a statement of complaint addressed to the court, praying for relief from the unjust acts of the defendant and for proper process. It was formerly a lengthy document consisting of nine distinct heads, but the form has now been shortened by the rules of the United States courts of equity. The same process has also been effected in practically all the States where separate equity courts are still maintained. In England such bills disappeared on the fusion of law and equity in accordance with the Judicature Act of 1873.

Bill is also a common expression for the two more usual kinds of negotiable instruments, bills of exchange and promissory notes. See BILL OF EXCHANGE; BILL OF LADING; BILL OF SALE; NEGOTIABLE INSTRUMENTS; PROMISSORY NOTE.

Billaud-Varenne, JEAN NICOLAS (1756–1819), French revolutionist, born at La Rochelle, the son of an attorney. His book, *Le Despotisme des Ministres de France* (3 vols., 1789), marked him as a leading spirit in the movement, in which he was one of the most extreme and bloodthirsty enemies of the royal family and of the bourgeoisie. He served as president of the Convention, and was on the Committee of Public Safety. With Tallien and Vadier he destroyed the dictator Robespierre (1794). In the following year he was transported to Cayenne, whence he escaped in 1816, and after visiting New York went to Haiti. He died at Port au Prince. His genuine *Mémoires* were issued by Begis in 1893; those published in 1821 were spurious.

Bill Brokers are persons whose business it is to study the condition of the money market and the state of credit generally, and who employ the knowledge so obtained in negotiating to the best advantage the sale and purchase of bills of exchange and promissory notes.

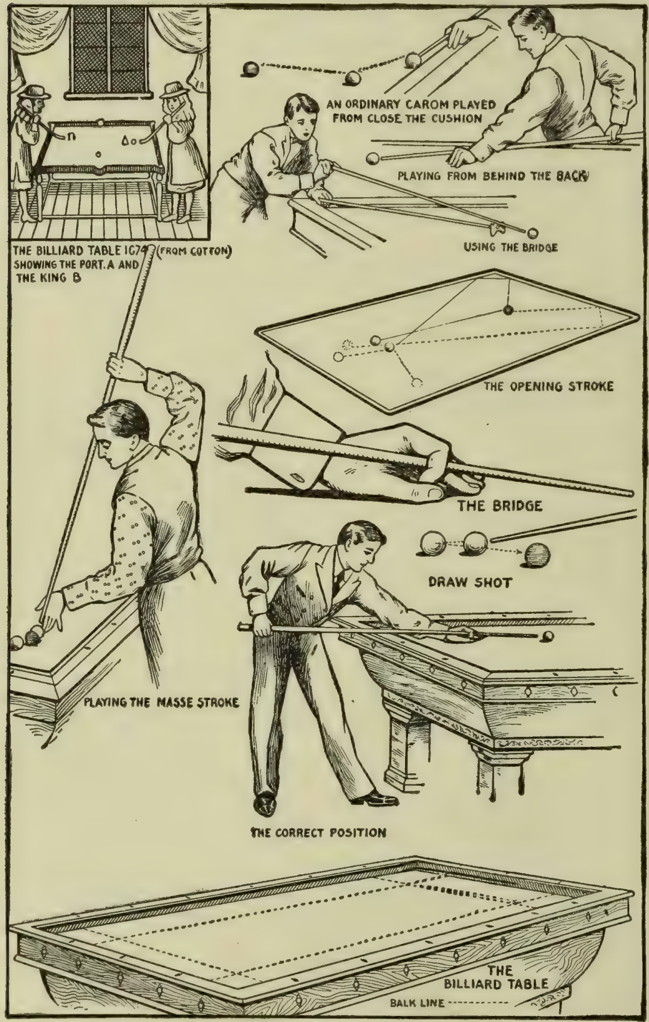


Bills or Beaks: Characteristic Forms.

Billerica, bil′rik-ȧ, town, Middlesex county, Massachusetts, on the Boston and Maine Railroad; 19 miles northwest of Boston. It has railway repair shops and woollen mills. Pop. (1900) 2,775; (1910) 2,789.

Billet, in architecture, an ornament belonging to the Norman style. It was formed by cutting a moulding—generally a round moulding—into notches, so that the parts left resembled billets of wood.

Billet, in heraldry, a small brick-shaped charge. BILLETE, or BILLETY, said of a shield *semée*, or strewn with an indefinite number of billets.


THE BILLIARD TABLE 1674 (FROM COTTON) SHOWING THE PORT. A AND THE KING B
AN ORDINARY CAROM PLAYED FROM CLOSE THE CUSHION
PLAYING FROM BEHIND THE BACK
USING THE BRIDGE
THE OPENING STROKE
THE BRIDGE
DRAW SHOT
PLAYING THE MASSE STROKE
THE CORRECT POSITION
THE BILLIARD TABLE
BALK LINE

The Game of Billiards.

Billeting, the compulsory quartering of troops on the civil population. In Great Britain at the beginning of the seventeenth century billeting was regarded as one of the chief popular grievances. It was declared illegal by the Petition of Right (1628), and was again prohibited by statute in 1679, but the Mutiny Act of 1689 and subsequent Mutiny Acts authorized it under certain conditions. It is now regulated by the Army Act of 1881, which is renewed annually. The only parties bound to provide accommodation for the troops are keepers of victualling houses, including inns, hotels, and places where alcoholic liquors are sold in retail. Payment is made according to a government scale. On the continent of Europe billeting is still adopted in the course of military manœuvres. During a campaign billeting becomes a necessity, in order to prevent the troops from being burdened with provisions and camp equipment.

In the *United States*, billeting is restricted by the Constitution, the Third Amendment of which provides that 'no soldier shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.'

Billiards. The origin of billiards is not clearly established. The best claim seems to be that for Henrique de Vigne, a French artist, who flourished during the reign of Charles IX. (about 1571), as he designed the first tables and drew up a code of rules. Originally the game was played with only two balls. About 1775 the third ball was introduced by the French and called a *carrom*, and later a fourth ball was added, but the change did not become popular, except in England, and at present the three-ball game is practically the only one played in America and France.

In 1795, following the introduction of the third ball, the game underwent many changes. Cues were also gradually changed until the present form was adopted, although it was not until 1806 that the leather tip was used, the advantage of chalk having been discovered at that time. Slate beds for the tables were first used in 1827, and ten years later rubber cushions were adopted, the whole bed and cushion being covered with dark green cloth. Since that time no changes of moment have been made in the construction of the table except to abandon the pockets in America and France.

United States.—Authentic history credits the introduction of billiards into America to the English officers in garrison in New York City during the eighteenth century. Naturally, the game of those early days was the one in vogue in England, and was played on a table with six pockets. In the course of years radical changes were made both in the table and the style of play, until a distinctively American game had been evolved. The pocketless table, cushion caroms, and balk lining all had their origin in the United States; while public matches and billiard tournaments were first held in that country. The principal American changes have been adopted in France also.

The present-day game of billiards in America is the three-ball carom. It is played on a pocketless table, whose standard measurements are 10 by 5 feet. In clubs and private houses a smaller table is often used, measuring 9 by 4½ feet, or even less. Three ivory balls, 2⅜ or 2¼ inches in diameter, are employed; two of these balls are white (one with a small black spot, to identify it), and the other is red.

In playing, a carom counts one, and is made when both the other (or object) balls are hit by the ball struck with the cue (*i.e.*, the cue ball). At the beginning of play both the lead and choice of balls are determined by 'stringing' or 'banking.' At the opening shot the red ball is placed on the spot at the foot of the table, and the white ball of the second player on the spot at the head. The first player then places his ball 6 inches to either side of the second player's ball, and inside the 'string' (the space bounded by the second diamonds on each side). On the opening shot, and when for any reason the balls are respotted, the red ball must be the first one hit by the cue ball, in order to count.

For foul strokes, suitable penalties are provided. Failure to hit either of the object balls is a 'miss,' and counts one for the opposing player. No count is made if the ball is struck by any part of the cue except the point; if the cue is not withdrawn from the cue ball before the latter comes in contact with an object ball; if the striker has not at least one foot on the floor; if he touches a ball in motion; if he plays the wrong ball; if he touches the cue ball more than once, or hinders or accelerates it; if in the act of playing he disturbs any ball other than his own; if he should disturb a ball after having played a counting stroke. Should he touch his own ball previous to playing, it is foul, and his opponent scores one.

It is also a foul if the striker plays directly upon any ball with which his own is in fixed contact (*i.e.*, 'frozen'). When the balls are thus frozen he may either play directly upon the ball with which his own is not in contact; or he may, by a massé shot, play away from the balls, and on the return of the cue ball effect a count, provided that the cue ball first hits the ball with which it was not previously in contact; or he may play to a cushion, and on the return of the cue ball may first hit either of the object balls; or he may have the balls spotted, and play from the string, as in opening the game.

Should a ball jump off the table, it is respotted on its proper spot. Should that spot be occupied, it is placed on the other end spot; if both are occupied, on the centre spot. If a ball jumps off after a carom has been made, the count is allowed and the ball respotted.

Persistent playing for safety is not permitted. Should a player make a miss in each of three successive innings, the opponent may reject the third miss, and require him to hit an object ball.

The object balls are 'crotched' whenever the centres of both lie within a 4½-inch square at any corner of the table. When so crotched, only three counts are allowed, unless one or both object balls are forced out of the crotch. In case of failure, the striker is out, and the opponent plays the balls as he finds them.

By the device of the *balk line*, more difficult methods of play were originated in American billiards. In the 14-inch game four lines are drawn on the table (from end to end and from side to side), 14 inches from the rails at every point. The spaces defined by these lines are the balk spaces. The large central space is not a balk, and there is no restriction to the number of caroms that may be made therein.

In general, the rules of three-ball carom govern the 14-inch balk-line game. The special rules are as follows: (1) The object balls are in balk when both have stopped inside any one of the balk spaces. A ball on the line is in balk, said ball being on the line when its point of contact with the table touches the line. When two object balls are on the same line, the striker has the option of saying in which balk they shall be called. (2) Only two shots are allowed when the two object balls are in the same balk space. Unless on the second shot at least one of the object balls is driven out of balk, the shot is void, the striker's hand is out, and the incoming striker plays the balls as he finds them. If on the second shot, however, an object ball is driven out and returns to the same space, the balls may be played as if in balk for the first time; so that the striker may continue in this way indefinitely by sending a ball out and back. (3) The object balls are 'in anchor' when their centres lie within a certain space 3½ by 7 inches. These spaces are eight in number, the centre (from left to right) of each being the balk line where it intersects the cushion, and each space being defined on one side by the cushion, and on the other three sides by lines drawn with chalk. When the balls are thus anchored, the striker may have two consecutive shots, but on the second shot must drive at least one of the object balls outside the anchor space, or lose both play and count. As when in balk, a ball that is driven out and returns to the same anchor space is considered 'in' for the first time.

The game most often played by professionals is the 18-inch balk line, with either two shots or only one shot in balk and anchor spaces. The lines are placed 18 inches from the cushions, and the rules are the same as for the 14-inch game.

In *cushion caroms* the cue ball must touch a cushion before the carom is completed, in order to count; in *three-cushion caroms* three cushions must be touched; in the *bank shot game* the cue ball must touch a cushion before striking an object ball.

In making cushion strokes the player should remember that the angle of reflection is equal to the angle of incidence, but that in making the stroke the angle may depend upon whether or not the ball is struck fairly in the centre without twist, under which conditions the ball moves forward without spin, which is practically the whole principle of the game. Should the point of the cue strike the ball on either side of its vertical axis, the ball will move forward in the line directed by the cue, but will spin in the direction struck. Struck high the ball follows on its course after driving the object ball out of the way, and is called a 'follow' shot. Struck low the ball spins back to the striker after hitting the object ball and is called a 'draw' shot. It will come back straight or at an angle, depending upon the side it is struck upon. A further twist is sometimes given the ball by slight twist of the cue while on the point of striking the cue ball. The difficult massé shot is made by striking the cue ball on the top with the cue at right angles to the table.

See Pool. Consult Brunswick-Balke-Collender's *Modern Billiards* (1909), and *Handbook of Rules; Daly's Billiard Book* (1913).

Billings, city, Montana, county seat of Yellowstone county, on the Yellowstone River, and the Great Northern, Northern Pacific, and Chicago, Burlington, and Quincy Railroads; 235 miles southeast of Helena. It is situated in a cattle and sheep raising district, and has coal mines, limestone and marble quarries. There are manufactures of flour, lumber, beet sugar, and brick. The U. S. Census showed 42 industrial establishments in 1914, with capital of $2,060,000, and products valued at $1,634,000. Pop.(1900) 3,221; (1910) 10,031.

Billings, Frank (1854), American physician, was born in Highland, Wis. He was graduated from Northwestern University (1881), and studied in Vienna (1885–6). He has served as professor of medicine at Northwestern University (1891–8); professor of medicine (1898–90) and dean of the faculty (1900–05) at Rush Medical College; and professorial lecturer (1901–05) and professor of medicine (since 1905) at the University of Chicago. In 1905 he was president of the American Medical Association; and in 1907 of the National Association for the Study and Prevention of Tuberculosis. Since 1901 he has been the editor of the *Year Book of General Medicine.*

Billings, JOHN SHAW (1839–1913), American surgeon and librarian, was born in Switzerland county, Ind., and was graduated from Miami University (1857). He studied medicine at the Ohio Medical College; served as surgeon in the Civil War; and after 1864 was connected with the Surgeon-General's office at Washington, for whose library he prepared the *Index-Catalogue* in sixteen quarto volumes. He supervised the vital and social statistics of the Eleventh Census. Dr. Billings retired from Government service in 1895, and the following year was made director of the New York Public Library. He was also medical adviser to the board of trustees of Johns Hopkins University; vice-president of the National Board of Health; professor of hygiene in the University of Pennsylvania; and a frequent lecturer at Yale, Harvard, Columbia, Johns Hopkins.

Billings, JOSH. See SHAW, HENRY W.

Billings, ROBERT WILLIAM (1813–74), English draughtsman, architect and author, was born in London, and was taught his art in the office of John Britton. He published several books on the practice of architecture, and works, illustrated by himself, on the Temple Church (1838), Carlisle and Durham Cathedrals (1840 and 1843), etc. But his fame chiefly rests on the *Baronial and Ecclesiastical Antiquities of Scotland* (4 vols., 1845–52).

Billings, WILLIAM (1746–1800), American composer, was born in Boston, Mass. He was a tanner by trade, but afterward became a teacher, and introduced into New England a spirited style of church music. He wrote the words to many of his tunes. He published *The New England Psalm Singer*, or *American Chorister* (1770), *The Singing Master's Assistant* (1778), *Music in Miniature* (1779), and the *Psalm Singer's Amusement* (1781). His anthems include 'Except the Lord Build the House,' and 'The Lord is Risen from the Dead.'

Billingsgate, a wharf and fish market on the left bank of the Thames, below London Bridge. The market was established in the reign of Queen Elizabeth, and was made free in 1699. The present buildings date from 1874. The name is often applied to the foul language characteristic of such places.

Billington, ELIZABETH, *née* WEICHSEL (*c.* 1768–1818), celebrated vocalist, was born in London. She made her *début* in Dublin in 1783, and in 1786 was engaged for Covent Garden at the then large salary of $5,000. She left London in 1794, and toured in Italy; then returning to London, she sang there from 1801 to 1811. Her voice had a compass of three octaves, and she excelled in florid passages. She was a striking beauty, and Sir Joshua Reynolds painted a fine portrait of her as St. Cecilia.

Bil'liton', BLITUNG, or BILTONG, an island of the Dutch East Indies, lies between Banka and the west coast of Borneo, with an infertile soil and heavy rainfall (100 to 125 inches annually). Tin occurs almost everywhere; the annual output is 5,000 to 6,000 tons. Other products are iron, gums, scented wood, sago, trepang, pepper, and tortoise shell. Area, 1,870 square miles. Pop. 40,000.

Bill of Adventure, a writing under the hand of a shipper of goods or a common carrier, showing that the shipment is the venture of another person, and that the shipper or carrier is responsible for nothing more than delivery of the cargo as consigned.

Bill of Attainder. See ATTAINDER.

Bill of Costs, an account of fees and other disbursements incurred by an attorney in a suit or other legal proceeding conducted by him. In the United States the costs of a litigation are usually prescribed by statute or by a rule of court; and when, as is usually the case, they are ordered to be paid by the defeated party, the bill of costs must be 'taxed,' or approved, by the clerk of the court in which the judgment was rendered. See COSTS.

Bill of Exceptions is a statement in writing of objections taken to the ruling of the court upon a point of law arising in the course of the trial. The admission or non-admission of evidence is a frequent subject of such bills. The objections must be tendered at the time when the decision is given, and the bill must be authenticated by the judge, or a majority of them, if more than one. Obviously, no question can be raised as to a decision upon a point which falls within the scope of judicial discretion. The validity of the objections is determined by a court having jurisdiction in error. See APPEAL.

Bill of Exchange is defined as 'an unconditional order in writing addressed by one person (called the *drawer*) to another (called the *drawee* or *addressee*), signed by the person giving it, requiring the person to whom it is addressed to pay on demand or at a fixed or determinable future time a certain sum in money to or to the order of a specified person (called the *payee*, who may be either the drawer himself or a third party) or to bearer.' The origin of this, perhaps the most important of all commercial instruments, is involved in obscurity. By Montesquieu and others it is attributed to the Jews, who, when banished from France and England in the 13th century, employed bills of exchange as a method of recovering the effects which they had perforce left behind them. By others the Venetians and Florentines are credited with the invention.

For several centuries bills of exchange were used only between merchants living in different countries. Their advantage is readily seen by means of a concrete example: A, a merchant in New York, owes $1,000 to B, a merchant in London; while B owes $1,000 to C, another merchant in New York. B draws a bill requiring A to pay $1,000 to C at a certain date, and forwards the bill to C in payment of the debt due to him. C presents it to A, who signifies his acceptance of B's order by signing his name on the bill, and is then called the *acceptor*. When the date mentioned in the bill arrives, C can exact payment from A. Thus the accounts are squared as between all the parties without any coin passing between New York and London. The transaction might have been carried through by C drawing on A, and sending the bill to him for acceptance. On receiving it back accepted by A, C sells it to B. B would then be A's creditor for $1,000 on the bill, and his debtor for $1,000 on a prior transaction, so that the respective rights and liabilities of the parties would be extinguished on the principle of compensation. Such bills are now known as *foreign bills*, as opposed to *inland bills* the parties whereto are resident in the same country. In the United States, each State is a foreign country for the purposes of bills of exchange.

The utility of inland bills may be exemplified thus: A owes $1,000 to B, the date of payment being six months hence. B cannot afford to wait for his money till the expiration of the period, so he draws on A for the amount, and obtains the latter's acceptance of the bill. He then sells the bill to a banker or other party who discounts bills for $1,000 less the interest on the amount for six months. Foreign bills can also be used in the same manner.

The opposite of a bill of exchange is a promissory note, which is made by the debtor, not drawn by the creditor. (See PROMISSORY NOTE.)

Money alone can be made the subject of a bill or note; an order to deliver so much merchandise would be useless. The sum in question also requires to be certain. A bill must be imperative in its terms—*i.e.*, payment must be required as a right, not merely as a favor. Acceptance can only be made by the drawee, and his signature alone, without further words, is sufficient. It must not express a promise other than the payment of money. Acceptance may be *absolute* when the drawer simply acquiesces in the order, or it may be *qualified* either in respect of being conditional, or partial, or of payment being restricted to a particular time or place.

The law merchant allows bills and notes payable to order to be transferred only by endorsement; but if payable to bearer, mere delivery is sufficient. If, however, the transferee of a bill payable to order gives full value for it, he acquires such right as the transferrer had in the instrument, and may require the latter to make an endorsement. The transfer by endorsement of a bill payable to order, or by delivery of a bill payable to bearer, is termed *negotiation*, the result being that a *bona fide* transferee for value is not affected by defects in the transferrer's title. Documents of the kind, where the transferrer can give a higher title than he himself has, are called *negotiable instruments* (q. v.).

An endorsement to be valid must be written on the bill itself; or if there be not room enough, upon a slip of paper attached to the bill. It may be in blank, when no particular endorsee is specified, and the bill thereupon becomes payable to bearer; or special, when some one is mentioned to whom or to whose order payment is to be made, or it may be restrictive when further negotiation is prohibited—*e.g.*, when payment is to be made only to the person named.

Endorsements are frequently made without recourse, especially in the United States. This means that the endorser is under no liability in the event of bill eventually turning out to be worthless. If the drawee declines to accept the bill, or to make payment when it arrives at maturity, it is said to be *dishonored.*

Accommodation bills are used where no debt is really due to the drawer by the drawee, but where the drawee agrees to accept the former's draft in order to raise a fund of credit. In such cases, though the drawer cannot enforce payment against the acceptor, yet if he endorse the instrument to another person in the ordinary course of business, the latter is not in any way prejudiced by the fact that no consideration was originally given.

Bill of Health is a certificate given to the master of a ship by the authorities of a port from which she sails, setting forth the condition of the place in regard to infectious diseases, as at the date of departure. A clean bill certifies the absence of such diseases; a suspected (or touched) bill indicates that though an outbreak has not actually occurred, yet the same is anticipated; a foul bill that contagious disorders are in reality prevalent. If a ship arrives at a port without a bill of health she will be detained in quarantine, just as if her bill were foul.

Bill of Indictment is a written accusation of crime preferred against one or more persons before a grand jury. See INDICTMENT.

Bill of Lading, the written instrument issued by a common carrier on taking custody of the goods to be transported by him. A bill of lading performs three functions: first, it is a receipt given by the carrier to the shipper for the goods delivered to him by the latter; second, it embodies the contract of carriage between them; third, it is a document of title to the goods shipped.

In the United States, bills of lading are governed by the *Federal Bill of Lading Act* (Pomerene Act), passed in August, 1916, and effective January 1, 1917. According to this Act, two kinds of bills may be issued—*straight bills,* when the goods are consigned or destined to a specified person, and *order bills,* when the goods are consigned to the order of any person named in the bill. Straight bills are non-negotiable, and must be so marked. Order bills are always negotiable, unless it is otherwise stated on the face of the bill in writing agreed to by the shipper. 'A person to whom an order bill has been negotiated acquires such title to the goods as the person negotiating, and also such title as the consignee and consignor had or had power to convey to a *bona fide* purchaser for value, and the direct obligation of a carrier as set forth in the bill.' He is not entitled to receive the goods, however, until he has satisfied the carrier's lawful lien for freight, storage, demurrage, terminal charges,and other expenses incident to transportation and delivery; has surrendered the bill; and has signed a receipt for the delivery of the goods.

All carriers are held liable for bills of lading duly issued and signed by their properly appointed agents. They are not liable for the quantity and quality of the shipment, in case of improper loading or misdescription of goods in the bill of lading, when such goods are loaded by the shipper and the bill states that it is the shipper's weight, load, and count.

Fraudulent practice in connection with bills of lading, as forgeries, counterfeits, etc., are misdemeanors punishable by imprisonment for not more than five years, a fine not exceeding $5,000, or both. See CARRIER.

Bill of Mortality was a weekly return, first made in 1592 after an outbreak of the plague, of the deaths occurring in the various parishes of the city of London and the diseases causing the same. Such bills ceased to be drawn up after 1842, when the modern system of registration had come into force. See LONDON.

Bill of Pains and Penalties. A legislative bill providing punishment for acts previously committed, whether such acts when committed were or were not prohibited by law. When such a bill involves corruption of blood and forfeiture of estate it is called a *bill of attainder.* Bills of Pains and Penalties being retroactive in their operation are prohibited in the United States by the provision of the Constitution (Art. I, Sec. 9) forbidding Congress and the several States from passing *ex post facto* laws except where the case comes under the provision vesting in Congress the power to define the crime of treason against the United States, and to declare its punishment. See ATTAINDER; TREASON.

Bill of Particulars, in legal procedure, an itemized statement of account rendered in the progress of a suit by the claimant of a sum of money for which judgment is demanded. The bill is sometimes contained in the pleading of the party rendering it, but is more often delivered on the demand of the opposing party or upon an order of the court.

Bill of Peace, a bill in equity filed to compel the consolidation of numerous suits against the same defendant arising out of the same cause of action, or to restrain repeated attempts to litigate the same controversy between the same parties. Its principal use in the latter sense was to prevent repeated actions of ejectment of the same claimant for the same parcel of lands. See QUIA TIMET.

Bill of Rights is the name commonly given to the statute in which is embodied the Declaration of Rights presented by both houses of the English Convention Parliament to the Prince and Princess of Orange in 1689. After declaring the late King James II. to have done various acts contrary to the laws of the realm, and to have abdicated the government, the Bill of Rights proceeds to enact in detail the celebrated declaration as to the rights and liberties of the English people. It was laid down that the crown had no power to suspend or dispense with the ordinary laws, or form judicial courts, or levy money without parliamentary sanction. The raising or keeping of a standing army within the kingdom in time of peace, unless with the consent of Parliament, was declared to be unlawful. Freedom of election for members of Parliament, freedom of speech in debate, and the right of the subject to petition the crown, were alike maintained. The act recognized William and Mary as the holders of the crown for their joint and separate lives, but with the administration of the government during their joint lives in William alone, and regulated the subsequent succession. A clause was finally added that the sovereign should take the test in the first parliament of his reign, and that if any king or queen should embrace the Roman Catholic religion, or intermarry with a Roman Catholic, their subjects should be absolved of their allegiance. See ENGLAND AND WALES, *History*.

Bill of Sale, as originally understood, is a formal deed transferring personal property under a contract of sale, and this meaning still survives in the case of sale of ships, delivery of the deed being equivalent to actual delivery of the ship. By Act of Congress of 1793 a bill of sale, setting forth at length the certificate of registry, must accompany every sale or transfer of a registered ship to a citizen of the United States. Bill of sale is, however, now more commonly employed in a derivative sense to denote a deed or instrument operating a transference in security of a debt or other obligation. Further, there is commonly held to underlie transactions by bill of sale an implication that possession of the goods has not passed to the purchaser or mortgagee.

The rule of the common law that a real right in chattels may pass without the transferee being put in possession of them is directly at variance with the principles of the civil law, and unless strictly guarded will act as a cloak to fraud. Thus A may mortgage certain of his personal goods to B by bill of sale, no change of possession taking place, and this gives B a claim over these goods preferable to that of a subsequent *bona fide* purchaser who in ignorance of the mortgage paid a full price for them. But if there is any fraud on the part of B, then at common law the transaction between him and A may be cut down. Moreover, it is settled that when possession of the goods is not transferred along with the deed, the transaction is presumed to be fraudulent unless circumstances prove it otherwise.

In some of the United States it is laid down by judicial decision or statute that such transactions, where no change of possession takes place, are conclusive of fraud. Accordingly in these States the legal position is not materially different from that existing in countries where the civil law rule prevails, to the effect that mere agreement without delivery of possession cannot operate a transference of property.

In England it has been provided by statute that all bills of sale must be registered in a prescribed manner within seven days of their date, otherwise they will be held invalid in competitions with an executive creditor or trustee in bankruptcy. The latter are thus relieved of the necessity of proving fraud.

Bill of Sight is a document signed by an importer of goods who is unable to make a perfect entry as to their quantity or quality. The best description possible in the circumstances is given, and the document serves as a warrant to the customs authorities to allow the goods to be landed. But a perfect entry must, however, be made before they are actually delivered to the importer. When bills of sight are used, the goods are liable to be sold if such entry is not completed within a specified time, usually a month.

Bill of Store, a document giving full particulars as to goods formerly exported from a country and reimported within a limited time, usually five or six years. Import duty is not generally charged on such goods.

Billon, a name (originally French) for a mixed metal sometimes used in coinage, consisting of gold or silver, with a large proportion of baser metal.

Billot, bē-yō′, JEAN BAPTISTE (1828–1907), French general and senator, born at Chaumeil, Corrèze department. After a distinguished career in Africa, he was given the command of the 18th Army Corps during the Franco-German War (1870–1). Elected in 1871 to the National Assembly, he was largely responsible for a bill to reorganize the staff of the French army in 1878. In 1882 he became Minister of War, but his refusal to deprive the Orleans family of military rank led to his resignation in 1883. He was Minister of War again in 1896–8, when he took a prominent part in the Dreyfus Affair of 1897.

Billroth, bil′rōt, ALBRECHT CHRISTIAN THEODOR (1829–94), German surgeon, born at Bergen, on the island of Rügen. He was appointed professor of surgery at Zürich in 1860, and at Vienna in 1867. He was the first to operate for cancer of the stomach, and to him is largely due the modern ambulance system. His eminence as a surgeon, and his services during the Franco-German War (1870–1), when he served in the German hospitals, were recognized by an appointment to the Austrian Upper House in 1887. His works include *General Surgical Pathology and Therapeutics; Care of the Sick at Home and in the Hospital* (1892).

Bills and Notes, a common expression for the two more usual kinds of negotiable instruments—bills of exchange and promissory notes. See BILL OF EXCHANGE; PROMISSORY NOTE.

Bil′ma, the southern and most important portion of the Kawar oasis, Central Sahara, Africa, in the Tibbu country (in 18° 40′ N. lat., 14° E. long.). Garu (Bilma proper) has rich salt mines.

Bil′ney, THOMAS (d. 1531), English martyr, was born in Norfolk about 1495, and was ordained priest at Ely in 1519. He preached against the mediation of saints, and was arrested in 1527. He abjured, and after a year's imprisonment returned to Cambridge, and resumed public preaching (1531). He suffered death by fire.

Biloxi, bi-lok′si, a small Indian tribe, originally dwelling on Biloxi Bay, but afterward in Louisiana, thought at first to belong to the Choctaws, but proved by Gatschet, in 1886, to belong to the Sioux.

Biloxi, city, Harrison county, Mississippi, on Biloxi Bay, an arm of the Gulf of Mexico, and on the Louisville and Nashville Railroad; 75 miles northeast of New Orleans. An electric traction line runs to Gulfport, and there is a shell road to Pass Christian. The city has a fine government building, opera house, sanitarium, and several churches. Its six-mile beach and excellent climate make it popular as a summer and winter resort. The chief business interests are the packing and shipping of oysters and shellfish, fruits, and vegetables. There are also shipyards, sash and door factories, and ice factories. The French settled nearby in 1699, and founded a town on the present site in 1712. For a few years Biloxi was the capital of the colony of Louisiana. Pop. (1900) 5,467; (1910) 8,049.

Bilse, bil′se, OSWALD FRITZ (1878), a lieutenant in the German army, born at Kern. He entered the army in 1898, and in 1903 wrote a book entitled *Aus einer kleinen Garnison*, a severe arraignment of garrison life in the town of Forbach. The book was suppressed, and the author sentenced to imprisonment and dismissal. The Minister of War said that though the book 'was a disgrace to a Prussian officer, part of it was unfortunately true.' The book has been published in England and the United States under the title *Life in a Garrison Town.*

Bil′ston, market town, Staffordshire, England; 2½ miles southeast of Wolverhampton It is a typical 'black country' town. Coal, iron, and casting-sand are plentiful in the neighborhood, and there are many blast-furnaces, foundries, and hardware factories. Its grindstones are famous. Pop. (1921) 27,565.

Biltong. See BILLITON.

Bima, bē′mȧ, seaport town, capital of the sultanate of Bima, is situated on the north coast of Sumbawa, Dutch East Indies. Fine horses are exported. Pop. about 10,000.

Bimet′allism, a monetary system in which there is free coinage of gold and silver at a fixed ratio, the coins of either metal being legal tender, as opposed to monometallism, in which one metal alone has the right of free coinage. Up to the beginning of the nineteenth century what may be called unconscious bimetallism prevailed in most of the countries of the world. Gold and silver were both coined according to the convenience of the sovereigns, but their coinage was not free. There was, moreover, no recognition of the necessity for a common ratio for the coinage of the two metals; neighboring states might coin them at different ratios, and much confusion and uncertainty arose. In 1816 England adopted the policy of monometallism, defining the pound sterling as 113 grains of pure gold, but this example was not followed by other European nations, nor by the United States, until after 1870. From 1803 to 1873 France employed a system of bimetallism, which was successfully maintained until Germany joined England in her gold monometallic policy. This broke the equilibrium which France and the other members of the Latin Monetary Union had been able to maintain and caused them to join the ranks of the gold-standard nations.

Two chief advantages are claimed for bimetallism. One is the maintenance of a par of value between the two metals, and a consequent steadiness of exchange between gold-using and silver-using countries. Owing to the greater importance of demand in determining the value of money (see PRICES; MONEY), the legal ratio recognized at the bimetallic mints exerts a controlling influence over the market ratio, and is sufficiently powerful to counteract great changes in supply. Slight fluctuations in the market value are met by a tendency to bring the cheaper metal in larger quantities to the mint, and to melt into bullion the more costly metal obtained in exchange.

A second advantage claimed for bimetallism rests on the argument that a joint standard is likely to be more stable than a single standard. The fluctuations in value of the two metals taken separately, it is true, may be greater both in amount and number than those of only one; but, taken jointly, they will probably be found to mitigate rather than to intensify each other.

On the other hand, it is argued that bimetallism presents more complications and is more artificial than monometallism; that it was tried for long periods in the past by individual nations, and caused great inconvenience, owing to the scarcity, from time to time, of one of the other metal, which had been attracted elsewhere by higher rates; that, granting that these difficulties might be overcome by the establishment of international bimetallism, it would still be difficult to secure agreement on the ratio to be chosen, or to prevent afterward the secession of one or more of the contracting parties.

The advantages of bimetallism can be attained only by the agreement of a group of the more powerful nations to coin both gold and silver at the same ratio. Such an agreement would undoubtedly bring about a demand upon these metals strong enough to keep them at the ratio agreed upon, but the increase in the output of gold since 1900 has given gold-using nations such an abundance of money and caused such a rise in prices that for all practical purposes the question of international bimetallism is dead.

Consult F. A. Walker's *International Bimetallism;* R. Griffin's *Case Against Bimetallism;* Darwin's *Bimetallism;* Laughlin's *History of Bimetallism in the United States;* White's *Money and Banking;* Sherwood's *History and Theory of Money;* T. H. Farrer's *Studies in Currency;* A. B. Hepburn's *History of Coinage and Currency in the United States;* H. D. Macleod's *Bimetallism;* J. F. Johnson's *Money and Currency* (1920); and *Reports* of the Monetary Commission, and of the International Monetary Conferences.

Bimlipatam, bim-li-pä-täm′, seaport, in the Vizagapatam district, Madras Presidency, India, on the Bay of Bengal; 15 miles northeast of Vizagapatam. In the 17th century the Dutch established a factory here, which was ceded to the British East India Company in 1825. Pop. 12,000.

Biñan, bē-nyän′, largest town in Laguna province, Luzon, Philippine Islands, on the west shore of Laguna Bay; 19 miles from Manila. The surrounding region produces rice and timber. Pop. 10,000.

Binche, bańsh, town, province of Hainault, Belgium; 15 miles southeast of Mons. Lace, pottery, leather and glass are manufactured. It was a scene of operations in the Battle of Mons (Aug. 23, 1914). Pop. (1910) 11,690.

Bindraban. See BRINDABAN.

Bindweed. See CONVOLVULUS.

Binet, bē-nā′, ALFRED (1857–1911), French psychologist, was born in Nice. He studied law and medicine in Paris, but soon turned his attention to experimental and pathological psychology. He is best known for his attempts to discover some standard for the measurement of degrees of intelligence, the outcome of which were the Binet-Simon tests (1905 and 1908). He also published *La psychologie du raisonnement* (1886); *Perception intérieure* (1887); *On Double Consciousness* (1896); *La Suggestibelité* (1900); *L'âme et le corps* (1915). He edited *L'année psychologique,* to which he contributed many articles.

Binet Tests. See INTELLIGENCE.

Bingen, bing′*e*n (anc. *Bingium* or *Vincum*), town, grand-duchy of Hesse, Germany, is situated on the left bank of the Rhine at its confluence with the Nahe; 17 miles west of Mainz. Noteworthy buildings are the fifteenth century Parish Church; the castle of Klopp, on the site of an ancient Roman fortress, now containing the municipal offices; the Rochus-Kapelle, a chapel on the brow of the Rochusberg, a high hill back of Bingen, in which the festival of St. Rochus is annually celebrated by thousands; and the Drusus Bridge, with its seven arches, built about 13 B.C. In the middle of the river opposite Bingen is the celebrated Mouse Tower where, according to legend, the cruel Bishop Hatto of Mainz was devoured by mice (969). On the opposite side of the river, a little above Bingen, is the ruined castle of Ehrenfels, erected about 1210. At a point in the river a little below Bingen are the dangerous rapids known as the Binger Loch. Widening of the channel at various times since 1834 has made navigation safe. Bingen is the seat of the Rhenish Technical College, a Technical and Industrial School, and a Commercial School. There are manufactures of tobacco, champagne, starch, and leather, and a large trade in wine and grain. Pop. about 10,000.

In the Middle Ages Bingen was a free town but later passed to the Elector of Mainz. It was often captured in the Thirty Years War and in 1689 was almost entirely destroyed by the French.

Binger, bañ-zhā', LOUIS GUSTAV (1856–), French African explorer, was born in Strassburg. He visited Senegal and the Sudan, and published studies on the language of the Bambara In 1887 he undertook a journey from Senegal to the river Niger. He reached Grand Bassam, on the coast, at the beginning of 1889. This journey he described in *Du Niger au Golfe de Guinée par le Pays de Kong et le Mossi* (2 vols. 1891). From 1898 to 1907 he was director of the French Colonial Department.

Bingham, bing'*a*m, HIRAM (1831–1908), American missionary, was born in Honolulu. He was educated at Yale, studied theology at Andover and in 1856 entered upon missionary service, to which he devoted his life, laboring chiefly in the Gilbert Islands. He translated the Bible and other religious works into Gilbertese.

Bingham, JOHN ARMOR (1815–1900), American jurist, was born in Mercer, Pa. He was educated at Franklin College, O., studied law, and practised at Cadiz, O., until his election to Congress in 1855. In 1864 he was appointed judge advocate general by President Lincoln, and the same year U. S. solicitor of the Court of Claims. He was in charge of the prosecution of Lincoln's assassins; and as chairman of the impeachment committee made the closing argument against President Johnson before the Senate. He was again a member of Congress (1865–73), and was chairman of the committee to draw up the Fourteenth Amendment. From 1873 to 1885 he was U. S. minister to Japan. His last years were passed in retirement at Cadiz.

Bingham, JOSEPH (1668–1723), English divine, was born in Yorkshire, and is best known as author of *Antiquities of the Christian Church* (10 vols.).

Bingham, THEODORE ALFRED (1858–), American soldier, was born in Andover, Conn., and was graduated from West Point in 1879. He was U. S. military attaché at Berlin in 1890–92 and at Rome in 1892–94, was in charge of public buildings and grounds in Washington, D. C., in 1897–1903, and on engineering duty in 1903–04. He was promoted brigadier-general and retired in 1904. He was police commissioner of New York City from 1906 to 1909, and Chief Engineer of Highways, New York (1911). In 1917 he was recalled to active service in the U. S. Army and acted as Chief Engineer on the staff of the commanding general, Department of the East. In 1919 he was again discharged from active service.

Bingham Canyon, Utah, Salt Lake county, on the Bingham and Garfield, and the Denver and Rio Grande Western Railroads. Pop. (1910) 2,881; (1920) 2,676.

Binghamton, bing'*a*m-ton, city, New York, county seat Broome county, on the Susquehanna River, and the Delaware, Lackawanna and Western, the Delaware and Hudson, and the Erie Railroads; about 81 miles southeast of Syracuse, and midway between New York and Buffalo. It contains four homes for orphan children, and is the seat of a State asylum for the insane. Notable buildings are the Central High School, Federal Government offices, State armory, opera house, and court house. Binghamton is situated in a rich agricultural region, and is noted for its dairy products. According to the Federal Census of Manufactures for 1919, industrial establishments number 228, with 7,477 wage earners, a total capital of $27,921,000, and products valued at $40,638,000. Automobile trucks and tires, flour, medicines, cigars, washing machines, glass, forgings, furniture, organs and pianos, carts and sleds, silk, cigar boxes, boots and shoes, valves, clocks, clothing, and leather are manufactured. Binghamton was settled in 1787, when it was known as Chenango Point. It assumed its present name in 1800. Pop. (1910) 48,443; (1920) 66,800.

Bing'ley, market town, Yorkshire, England, on the Aire River; 15 miles northwest of Leeds. Worsted and paper are manufactured. Pop. (1911) 18,759; (1921) 18,949.

Binh - Dinh, town, Annam, French Indo-China, 205 miles southeast of Hué. Eleven miles to the southeast is the town of Kwinhon, or Quinon, its port on the China Sea. Pop. 74,400.

Binh-thuan, small town, Annam, French Indo-China, capital of province Nha-Trang, 130 miles northeast of Saigon.

Binmaley, bēn'mȧ-lā'ē, town, Luzon, Philippine Islands, on the Gulf of Lingayen at one of the mouths of the Agno River. The chief industry is the growing of rice. Pop. 16,400.

Bin'nacle (originally *bittacle*, from Fr. *habitacle*), a stand or case for holding a ship's compass. Formerly this consisted of a rectangular wooden locker containing three compartments with sliding shutters, the two side ones holding a lamp or candle in each, and the middle compartment having a compass suspended by a gimble ring placed in ears fastened to the sides of the compartment. The modern binnacle is of brass or bronze and, besides supporting the compass and containing arrangements for the illumination of it by night, is fitted with various devices whereby the magnetic needle is protected against the effects of shock and vibration, as also against the permanent and induced magnetism of the vessel in which it is placed. See also COMPASS.

Bin'ney, HORACE (1780–1875), American lawyer, was born in Philadelphia, Pa., and was graduated (1797) from Harvard. He was called to the bar in 1800, served in the Pennsylvania legislature, and prepared the six volumes of reports of the Pennsylvania Supreme Court decisions known by his name (1807–14). He practised law with distinguished success in Philadelphia until his election to the Twenty-third Congress (1833–5), in which he was a defender of the United States bank. He retired definitely from practice in the courts in 1836, appearing but once thereafter, to defend the Girard trust.

Binney, THOMAS (1798–1874), English non-conformist divine, was born in Newcastle. He was Congregational minister at Bedford; Newport, Isle of Wight (1824); and Weigh House, London (1829–69); and for a time was professor in the Congregational New College, London. He was a powerful opponent of the Established Church and of ritualism. His most popular work is, *Is it Possible to Make the Best of Both Worlds?* (1853).

Binney, W. G. (1833–), American conchologist, was born in Boston, Mass., son of Amos Binney, himself an authority on molluscs. He edited an edition of his father's works and prepared for the Smithsonian Institution a work on the *Land and Fresh-Water Shells of North America* (1869), and numerous monographs on the same subject. The collection of North American shells at the Harvard Museum was made by Amos and W. G. Binney.

Bino'mial (Lat. *bis*, 'twice;' *nomen*, 'a name'), an algebraic expression containing two terms. By the binomial theorem any power of a binomial can be expanded into a series. The formula is—

$$(x+a)^n = x^n + nax^{n-1} + \frac{n\,.\,n-1}{1\,.\,2}a^2x^{n-2} + \ldots$$
$$\frac{n\,.\,n-1\,.\,.\,.\,n-r+1}{1\,.\,2\,.\,3\,.\,.\,.\,r}a^2x^{n-r}$$
$$+\frac{n\,.\,n-1}{1\,.\,2}a^{n-2}x^2 + na^{n-1}x + a^n.$$

$$Ex.\ (x+a)^5 = x^5 + 5ax^4 + 10a^2x^3 + 10a^3x^2 + 5a^4x + a^5.$$

Bintang, island in Dutch East Indies, off Singapore, acquired by the Netherlands in 1823. It produces spices, sago, rice, and sugar. Area, 450 square miles. Pop. about

18,000, almost entirely Malays and Chinese.

Binturong (*Arctitis binturong*), a civet-like carnivore, a native of the E. Indies, arboreal and nocturnal in its habits, with a long, prehensile tail, tufted ears, and bristly fur.

Binue. See BENUE.

Biobio. (1.) River of Chile, rising in the Andes, and flowing in a N.W. direction through the prov. of Biobio, enters the Pacific at Concepcion, after a course of 220 m. The mouth is 2 m. wide, and the river is navigable for 100 m. (2.) Province of Chile, with an area of 4,158 sq. m., and a pop. (1895) of 88,749. Cap. Los Angeles.

Biogenesis, a term used by Huxley in his *Lay Sermons* for what he defines as 'the hypothesis that living matter always arises by the agency of pre-existing living matter.' The term for the opposing doctrine is *abiogenesis*. See BIOLOGY.

Biograph. See CINEMATOGRAPH.

Biography is the art of presenting a life-work in full and significant delineation. Memorial tributes are an early feature in literature. Even the aged Nestor utilized the privilege of the panegyrist when he harangued his juniors on the tented field; and there is a similar attitude in Plato's delineation of Socrates. Xenophon, another Socratic disciple, writes *Memorabilia* of his master; and though the same author's *Cyropædia* is romantic and fanciful, and his *Agesilaus* is a panegyric, he works them round genuine individual greatness. This is the rudimentary memoir, and, somewhat later, the lament of Moschus over Bion set an elegiac example that has had momentous results. Several Latin writers have merits as biographers. Cicero shows abundantly that he might have written lives with high success. Cornelius Nepos, Sallust, Quintus Curtius, and Tacitus all contribute to this department of literature. The *Agricola* of Tacitus is an admirable presentation of life and character. Suetonius is inartistic, but not without merit. The *Anabasis Alexandron* of Arrian is valuable both for matter and style. But Plutarch, who lived in the reign of Domitian, is the first great biographer in the world's history. His *Parallel Lives* comprises forty-six biographies in pairs, a Greek and a Roman alternately, and several separate sketches, the whole constituting a work of sovereign value. It has been often translated, and North's English version of 1579 introduced Shakespeare to this gallery of noble characters.

Now and again in the middle ages there are notable products of biographical impulse. The Venerable Bede (673–735) wrote the *Life of St. Cuthbert*. St. Adamnan (d. 704) produced in his *Vita Sancti Columbæ* a genuine memoir, edited in 1857 by Dr. Reeves. A real and worthy life-study presents itself in Einhard's *Vita Caroli Magni*—the life of Charlemagne (*c.* 820). Of this there are various editions, and an English version was published by Mr. W. Glaister in 1877. Alfred the Great was also fortunate in his contemporary biographer, Asser Menevensis, a monk whom the king appointed bishop of Sherborne. First published in 1572 by Archbishop Parker, the best edition of it is that of Wise (1722). Six early biographies of St. Dunstan (960–988) were edited by Bishop Stubbs in his *Memorials of St. Dunstan* (1875). Ælfric's *St. Guthlac* and William of Malmesbury's *Wulfstan* both deserve mention. The biographical work of the middle ages fitly culminates in Boccaccio's reminiscences of Dante, this happy connection, as has been aptly said, supplying 'a great man to describe a greater.'

Formal biographers were somewhat late in appearing in English literature. In the 14th and 15th centuries there were choice opportunities, but the literary bias was towards other ideals. Sir Thomas Malory, Lord Berners, and Caxton might have been biographers under other conditions, for they had direct sympathy with personalities; and Caxton's devotion to earlier men of letters helped materially to establish their importance. Prose style steadily developed in the 15th century, and is well illustrated in the work of 'saintly Fisher and unbending More.' Fisher's prose is strong and not inartistic, and the funeral sermon on Henry VII. shows a capacity for a memorial record. More's *Richard III.* (1513) is more than a merely biographical study, but it recognizes the importance of grouping historical facts round an individual career. A lurid record of the times is Foxe's *Acts and Monuments of the Church*, or the *Book of Martyrs*, published at Basel in 1559 (Eng. ed. 1563). William Roper, who died in 1577, wrote the *Life of Sir Thomas More*, edited by S. W. Singer in 1817.

There are still few biographies in the Elizabethan age. Cavendish's *Life of Cardinal Wolsey*, written about 1557, and first printed in 1641, is a striking little book which was undoubtedly used in the composition of Shakespeare's *Henry VIII.* The somewhat unsatisfactory *Life of Sir Philip Sidney* by Lord Brooke, published in 1652, has supplied points that have been constantly used by subsequent biographers of the perfect, gentle knight. There is room for regret that Ben Jonson did not write a life of Shakespeare. How much it might have told, and what fatuous speculations it might have prevented! Jonson's memorial tributes are admirable, but a biography would have enhanced his literary reputation, and earned lasting gratitude. Bacon, whose *Henry VII.* has certain biographical merits, fared somewhat better than Shakespeare; various biographies, *Baconiana*, etc., duly followed the *Life* by Rawley, published in 1657. Passing reference must be made to the biographical material in Drummond of Hawthornden's *Notes of Ben Jonson's Conversation* (Shakespeare Society Papers, 1842). Sometimes irrelevant and occasionally indiscreet, these records make a unique episode. Milton's *Life*, by his nephew, Edward Phillips, appeared in 1694, and another was published by Toland in 1699. Both were useful, but have small literary merit. Fuller's *Worthies of England* (1662) is an attractive miscellany. Mrs. Hutchinson (1620–64) produced, in her *Life of Colonel Hutchinson*, a work of uncommon merit, which was not published till 1806. Clarendon's *History of the Rebellion* has interesting biographical features; it appeared in 1704–7. But the foremost biographer of the age is Izaak Walton, whose *Lives* of Donne, Wotton, Hooker, Herbert, and Sanderson appeared, in the order named, between 1640 and 1678. A volume containing the first four was published in 1670 and the complete set was edited in 1796, with a *Life* of Walton by Dr. Thomas Zouch. Unaffected in style, and radiant with the author's genial personality, these biographies have an enduring charm. John Evelyn (1620–1706) produced a pleasing *Memoir of Margaret Blagge*, wife of Godolphin, the lord treasurer (ed. Bishop Wilberforce, 1848). Anthony à Wood's *Athenæ Oxonienses* (1691) is a storehouse of information and gossip about Oxford men. To 1691 belongs also Langbaine's *English Dramatic Poets*, an explicit and faithful record. John Aubrey (1626–97) wrote curious and valuable 'Minutes of Lives' (Bacon, Milton, Hobbes, etc.), first published in *Letters by Eminent Persons* (1813). Gilbert Burnet, biographer of Matthew Hale, has much good matter in the *History of his own Time*.

Literary accomplishment marks the biography of the 18th century. Steele's tribute to Addison (*The Theatre*, 1720) makes a good beginning. Roger North (1653–1734) wrote lives of himself and his brothers, and the engaging *Lives of the Norths* appeared in 1742–44. Middleton's *Cicero* (1741) and

Jortin's *Erasmus* (1758) are standard works. Theophilus Cibber's *Poets* and his *Actors and Actresses*, both dated 1753, help to mark the onward movement. Literary grace and charm were given to biography by the illuminating pen of Goldsmith. His *Voltaire* (1759) utilizes his personal knowledge, and displays his narrative and descriptive resources. In 1762, after a sojourn in Bath, he produced his inimitable mock-heroic *Life of Beau Nash*, conferring immortality on a marionette of supreme quality. His *Parnell* and *Bolingbroke*, published in 1768 and 1770 respectively, are less important. It is an easy transition from Goldsmith to Dr. Johnson, whose *Lives of the Poets* (1779) remains, after all possible deductions, an admirable specimen of literary biography. Some of the best are those of the smaller men, some are manifest results of mere journey-work, and some —those, for example, of Milton and Gray—exhibit strong prejudice. In all, the independent critic works steadily, heedless of results. In the *Life of Dr. Johnson*, published in 1791, James Boswell took the foremost place among British biographers. His artlessness is the secret of his success. His genial affability recalls the method of Walton. 'An inspired idiot' he may have been, but he was a superb artist in biographical narration. The high character of the 18th-century biography is well sustained by William Roscoe in his strong and picturesque *Lorenzo de' Medici* (1796).

The development of the biographer's art made great advance in the 19th century, as may readily be seen from a comparison of a work like Hayley's *Cowper* (1803) with the elaborate studies of later days. Books such as Hayley's give more minute and more skilful biographers a fresh opportunity. The same thing may be said of the work of Dr. Thomas M'Crie, whose *Life of Knox* appeared in 1811, and *Life of Andrew Melville* in 1819. Whatever Sir Walter Scott wrote has value. His small biographies have interest and charm, and his *Life of Dryden* (1808) maintains its authoritative position. His elaborate work on Napoleon, produced later in life, was the result of the most serious and elaborate preparation, but it was done at a time when Scott was unable to devote to his materials those great and apparently inexhaustible powers that had so long done marvellous service. Southey was an ideal biographer, whose mastery of his art did not always imply exact and detailed knowledge of the subject under discussion. His *Life of Nelson* (1813) is one of the most readable books in the language, and he is hardly less successful with his *Life of Wesley* (1820) and his *Life of Bunyan* (1830). His *Cromwell* and his *Dr. Andrew Bell*, both published in 1844, are not important; for in the one case the subject is too great for the treatment it receives, while in the other there could never be more than a temporary interest involved. Hazlitt, like Scott, failed with *Napoleon* (1828), but his *Conversations with James Northcote* (1830) is a personal record of unique and stimulating interest. Moore's *Byron* (1830) might well have been other than it is—it would have been somewhat less amorphous had Moore been possessed of stronger critical powers—but it has indubitable qualities of greatness. The *Life of Crabbe* (1834), by his son, does justice to a very worthy subject. With Lockport we reach one of the literary heights and resting-places of the century. His *Burns* (1828) has strength, tone, and style; and after all that has been written on the poet, it maintains its authoritative value. With his other study Lockhart was most happily fitted. He was closer to Scott than even Boswell was to Johnson, and his *Life of Scott* (1837–9) competes with Boswell's great work for the first position among English biographies.

With Carlyle the survey makes a fresh start. A unique figure in literary history, he touched nothing on which he did not leave strong marks of his personality. His lectures on *Heroes and Hero-worship* have much interest for the student of biography. His *French Revolution* is a brilliant picture gallery, that leaves, by its numerous representative delineations, impressions of the most vivid and powerful character. His *Past and Present* is a continuous and fascinating study of personal merit or demerit and the consequent moral influence. His true and sincere man he finds in the lofty poet, as in Schiller; in the comparatively unimportant man of letters—good and great if only he be worthy—as in John Sterling; and in the statesman and the ruler, as in Cromwell and Frederick the Great. Probably Carlyle has not said the last word on his poet and his men of action—other studies of Cromwell have already appeared, Carlyle's own treatment is found to need supplementing, and the *Frederick* is not immaculate—but on John Sterling he is definite and final. Him he has firmly placed with those literary friends who are commemorated in *Lycidas* and *Thyrsis*, and this consideration marks an important feature in biographical work. Carlyle's *Sterling* shows that the biographer discovers and reveals essential greatness, being himself a prophet or seer. *Schiller* in its first form appeared in 1825, *Oliver Cromwell's Letters and Speeches* in 1845, *John Sterling* in 1851, and *Frederick the Great* in 1858–65.

Meanwhile other biographers were at work, and making contributions to their subject that in some respects fell hardly short of even Carlyle's achievement. Dean Stanley's *Life of Dr Arnold* (1844) at once asserted its claim to recognition as a performance of rare excellence; and the same may be said of Hill Burton's *Life and Correspondence of Hume* (1847). John Forster is one of those whose exceptionally excellent results seem to prove the saying that, like the poet, the biographer is born, not made. His *Goldsmith* (1848) was most elaborately refined into its ultimate beauty of form and feature. His *Landor* (1868) and *Dickens* (1872–4), hardly less well done, are both works of very fine quality. His *Swift* remains a promising fragment. Mrs. Gaskell's *Charlotte Brontë* (1857) has distinguished grace and charm—the author, herself an eminent novelist, being able to work with ready sympathy on her deeply suggestive subject. In his *Life of Goethe* (1859) George Henry Lewes produced a singularly bright and substantial work, giving in it one of the best studies of a foreign author made by an Englishman. The Rev. Stopford Brooke's *Frederick W. Robertson* (1865) is, on the other hand, a most successful delineation of one great English preacher by another, whose position was destined to be high in pure literature as well as in the studies peculiar to his profession. James Spedding's *Bacon* (1857–74) is the result of long and special application to his subject, and has monumental significance. By far the greatest work of Mark Pattison is his *Life of Casaubon* (1875), the author fully mastering the inherent difficulties of his task, and producing a book of high and enduring quality. Sir Theodore Martin's *Life of the Prince Consort* (1874–80) happily weaves contemporary history about a personality of unaffected dignity and attractiveness, his somewhat delicate undertaking being accomplished with spirit, tact, and thoroughness. Sir Theodore had qualified as biographer with his bright memoir of his friend Professor Aytoun in 1867, and he gave further illustration of his rare skill, sympathy, and personal devotion in his *Lord Lyndhurst* (1883) and *Helen Faucit, Lady Martin* (1900). Sir George Trevelyan's *Macaulay* appeared in 1876, and at once became a classic. Prof. Masson's *Life of Milton* (1859-80) combines history with biography on a most extensive plan, and challenges criticism of its bulk while presenting the results of wide investigation and practised literary skill. Froude's *Carlyle* (1882–84), lacking in the reticence desired by some, has the countervailing recommendations of comprehensiveness and charming style. His *Julius Cæsar* (1886) is a thoroughly sound little book. Mrs. Oliphant, who proved her biographical competency in the *Edward Irving* of 1862, further illustrated it in her *St. Francis of Assisi* (1870), *Montalembert* (1872), *Principal Tulloch* (1888), and her volumes on Florence and Venice. In 1897 she produced the first two volumes of *William Blackwood and Sons: Annals of a Publishing House.* John Morley's *Edmund Burke* (1867), *Voltaire* (1872), *Rousseau* (1876), *Diderot* (1878), *Richard Cobden* (1881), and *Life of Gladstone* (1903), are all standard works of distinguished character. An equally distinguished place is to be assigned to Sir Leslie Stephen's *Henry Fawcett* (1885) and Professor Dowden's *Shelley* (1886). The late nineteenth century did all possible justice to Shakespeare. The outstanding biographies are Halliwell-Phillipps' *Outlines* (7th ed. 1887) and Mr. Sidney Lee's exhaustive *Life of William Shakespeare* (1899).

The first quarter of the twentieth century witnessed a tremendous increase in biographical writing, as well as a marked change in the manner of treatment. Lytton Strachey's *Eminent Victorians* (1918) is one of the earlier examples of the modern type of biography which is not content with a mere recital of incident, but which seeks to set forth the personality of the subject, with his frailties and his weaknesses, as well as his excellencies and virtues.

The mass of material makes any selection of outstanding biographies of the twentieth century inadequate, but the following English biographies are generally considered to rank among the best: Mackail's *Life of William Morris* (1899); Huxley's *Life and Letters of Thomas Henry Huxley* (1900); Balfour's *Life of Robert Louis Stevenson* (1901); Lee's *Queen Victoria* (1902); Monypenny's *Life of Benjamin Disraeli* (6 vols. 1910–20); Benson's *Ruskin* (1911); Sinclair's *The Three Brontes* (1912); Austen-Leigh's *Jane Austen* (1913); Hudson's *Napoleon* (1914); Stacpoole's *François Villon* (1917); Robertson's *Otto Bismarck* (1918); Strachey's *Queen Victoria* (1921); Charnwood's *Abraham Lincoln* (1916) and *Theodore Roosevelt* (1923); Steuart's *Robert Louis Stevenson* (1924).

Of biographies by American writers there may be mentioned: Marshall's *George Washington* (1804–07); Irving's *Life and Voyages of Christopher Columbus* (1828); P. M. Irving's *Washington Irving* (1909); R. W. Griswold's *Poe* (1850); Gilmore's *President Garfield* (1880); Lounsbury's *James Fenimore Cooper* (1881); Kennedy's *O. W. Holmes* (1883); J. Hawthorne's *Nathaniel Hawthorne and His Wife* (1885); *William Lloyd Garrison—The Story of His Life,* told by His Children (1885–9); J. E. Cabot's *R. W. Emerson* (1887); Nicolai and Hay's *Abraham Lincoln: A History* (1890); J. Parton's *General Jackson* (1892) and *Thomas Jefferson* (1894); E. E. Hale's *James Russell Lowell and His Friends* (1898); A. V. G. Allen's *Phillips Brooks* (1900); Lyman Abbott's *Henry Ward Beecher* (1903); Riis' *Theodore Roosevelt* (1904); Greenslet's *Life of Thomas Bailey Aldrich* (1908); Palmer's *Life of Alice Freeman Palmer* (1908); Spargo's *Karl Marx* (1909); Gilchrist's *Life of Mary Lyon* (1910); Paine's *Mark Twain* (1912); Barrus' *John Burroughs* (1914); Laura E. Richards' and Maude Elliot Howe's *Julia Ward Howe* (1915); Beveridge's *Life of John Marshall* (1916); Bruce's *Benjamin Franklin* (1917); Will's *Life of Cardinal Gibbons* (1922); Hendricks' *Life and Letters of Walter Hines Page* (1922–5); Wm. Allen White's *Woodrow Wilson* (1924); Lowell's *Life of Keats* (1925); Werner's *Brigham Young* (1925).

Some representative Italian biographies are Vasari's *Painters, Sculptors, and Architects* (1550); Muratori's *Rerum Italicarum Scriptores* (1723–51); *Life of Boccaccio,* by Baldelli and by Tiraboschi; *Machiavelli e i suoi Tempi* (Eng. trans. 1890); Castiglione's *Raphael; Life of Benvenuto Cellini,* translated by John Symington (1917); Papini's *Life of Christ* (1922). In French, the *Vie de Saint Louis of Joinville* (1309) has distinct literary importance, as have also Brantôme's outspoken and vivid *Memoirs* (1659). The *Mêmoires* of Saint-Simon (1675–1755) are a rich mine of history and biography. Later French biographers are Voltaire, Cousin, Guizot, Montalembert, and Sainte-Beuve (*Portraits litteraires, Port Royal, Causeries de Lundi,* etc.). Noteworthy also are Keim and Lumet's *Louis Pasteur* (1914); Fleury's *Eugênie, Empress of the French* (1920); Maurois' *Ariel: the Life of Shelley* (1925). German biographers include Forster, Schröckh, Herder, Bruhns, Guhrauer, Klein, Fischer, Varnhagan von Ense, Barthold, Haym, Otto Jahn, Ranke, Düntzer, Köstlin, Zeller, Brandl. Brandes' *Goethe* (1923) is notable for its historical scholarship.

Cyclopædic biographical works, both general and particular, have been frequently compiled. These include: *Acta Sanctorum of the Bollandists* (1643–1794); Bayle's *Dictionaire historique et critique* (1697, etc.); *Biographia Ecclesiastica* (1704); *Biographia Britannica* (1747–66, ed. Dr. Kippis; with additions, 1777–93); *Biographia Classica* (1778); *Biographical Dictionary, New and General* (1798); Michaud's *Biographie universelle* (1811–28; new ed. 1870, etc.); Chalmer's *Biographical Dictionary* (1812–17); Rose's *New General Biographical Dictionary* (1829–47); Chambers' *Biographical Dictionary of Eminent Scotsmen* (1835; new ed. 1859); *English Cyclopædia,* with biographical section (1856); *Nouvelle biographie gênêrale* (1857–66); *Das geistige Deutschland: Deutsches Künstler-Lexikon der Gegenwart* (1898); J. Thomas' *Dictionary of Biography* (1870); Appleton's *Cyclopædia of American Biography* (1888); American Historical Society's *Encyclopedia of American Biography* (1916–23); *Allgemeine Deutsche Biographie* and many others. National dictionaries, in whole or in part, have been produced in Great Britain, Sweden, Holland, Austria, Germany, Norway, Italy, Spain, and Belgium. The *English Dictionary of National Biography,* one of the most comprehensive and thorough of such enterprises, was edited in 66 volumes by Sir Leslie Stephen and Sidney Lee (1885–1901). The first cast of Lee's important biography of Shakespeare was in this work, and its concluding volume contains his full and authentic life of Queen Victoria, which was subsequently published separately.

Individual writers have produced groups of biographies, of which the following are examples:—Allan Cunningham's *British Painters, Sculptors, and Architects* (1829–33); Agnes Strickland's *Queens of England* (1840–8), *Queens of Scotland* (1850–9); Mrs. Jameson's *Early Italian Painters* (1845); Campbell's *Lord Chancellors* (1845–7) and *Chief-Justices* (1849–57); Lord Lindsay's *Lives of the Lindsays* (1849); Hook's *Archbishops of Canterbury* (1869–76); Smiles' *Engineers* (1862); Doran's *Their Majesties' Servants* (1864), biographies of English actors and actresses; Grove's *Dictionary of Musicians* (1879–85); Baker's *Biographical Dictionary of Music and Musicians* (new ed. 1911–20); Sir William Fraser's *Scotts of Buccleuch* (1879), and other similar works on noble houses; Miss Thackeray's *Book of Sibyls* (1883); Hamilton's *Poets Laureate of England* (1888); Dean Burgeon's *Twelve Good Men* (1888); Bigham's *Prime Ministers of Britain 1729–1921* (1922); Buckland's *Dictionary of Indian Biography* (1906); Kelly and Burrage's *American Medical Biographies* (1920).

Many valuable monographs have been contributed to various series, which have multiplied in great profusion. Among these are: 'English Men of Letters,' an admirable biographical library, edited by John Morley; 'English Worthies'; 'English Men of Action'; 'English Statesmen,' containing Lord Rosebery's monograph on Pitt; 'Eminent Women'; 'The Queen's Prime Ministers'; 'Great Writers'; 'Heroes of the Nations'; 'Great Craftsmen'; 'Modern English Writers'; 'Westminister Biographies'; 'Makers of British Art'; 'Great Educators'; 'The World's Epoch-makers'; 'American Men of Letters'; 'American Statesmen.'

See also Autobiography.

Biological Research, Marine. See Marine Biological Research.

Biological Survey, U. S., a bureau of the Department of Agriculture, established in 1885 as the Division of Economic Ornithology and Mammalogy, and after various changes of name, given its present title in 1905. The bureau studies the distribution and habits of native wild life, makes biological surveys of areas, and maps the natural life zones of the country; investigates the relation of wild birds and animals to agriculture and stock raising, with a view to the control of the harmful and the conservation of the useful species; conducts co-operative campaigns for the extermination of predatory wild animals, destructive rodents, and other injurious forms; experiments in fur farming, and studies the diseases to which fur bearers are subject in captivity; conducts investigations for the improvement of Alaskan reindeer; promotes the conservation of wild life and the establishment of wild-life reservations; maintains bird refuges and big-game preserves; administers Federal laws relating to migratory game, non-game, and insectivorous birds, to importations of foreign wild birds and mammals, and to interstate commerce in wild birds and game; and, through representation on the Alaska Game Commission, assists in the protection of game and land fur animals in Alaska.

Biol'ogy, the science of living things, in distinction from physics and chemistry, which deal with lifeless things. Since living things are dependent for their existence upon lifeless materials, and since matter is constantly passing from one state to the other, and is always subject to physical and chemical law, whether for the time being it is living or non-living, it is perhaps more accurate to define biology as the science which deals with 'matter in the living state' (L. L. Woodruff). As our first contacts with our environment are always through the medium of concrete objects, so man's first knowledge of living things led him to distinguish plants from animals, and the study of plants as such and of animals as such gave us the older sciences of botany and zoölogy. But the longer we study living things, the more clearly do we see that animals and plants are alike in many fundamental characteristics which distinguish them sharply from non-living objects. It is these general features which all living objects have in common that form the subject matter of the newer science of biology.

The term 'biology,' meaning literally 'life lore' was first used by Lamarck in a work which appeared in 1801. It was used in the following year, to all appearance independently, by Treviranus.

Protoplasm. — The material basis of life is protoplasm, a substance found in all living creatures, whether plant or animal. It contains the commonest chemical elements of the earth's crust and no others, but is very complex and unstable in its organization, so that any attempt to make a complete chemical analysis of it results in its death. We know, however, what chemical elements it contains and in what general proportions. The most abundant ones, in the order of their abundance, are oxygen, carbon, hydrogen, and nitrogen. In its physical properties, protoplasm is a jelly-like, granular, semiliquid substance, but we commonly find associated with it formed products which are more conspicuous than the living substance itself, such as the cell-walls of plants, and the shells or skeletons of animals. There is nothing unique in its appearance or in any one of its activities to distinguish it from lifeless objects, but in combination its properties and activities *are* unique.

Certain lowly forms of life, such as the bacteria of the soil and green plants, are able to take up the lifeless materials of the earth's crust and convert them into protoplasm, but the great majority of organisms can utilize as food only the bodies or formed products of other organisms. Thus all animals feed upon other animals or upon plants. Plants alone can produce the food for all other organisms from lifeless materials.

Growth.—The first noteworthy characteristic of living creatures is their ability to grow at the expense either of lifeless materials or of the formed products of other living creatures. Such materials they 'make over' into their own bodies, a process known as metabolism (q. v.). Their bodies, in turn, undergo destructive changes (largely oxidations) liberating energy for vital processes, such as movement, the secretion of formed products, and the elimination of waste products, as carbon dioxide and urea. Metabolism accordingly may be either constructive or destructive in character. Both types are continuously in progress in living bodies. Generally speaking, it may be said that in plants constructive processes predominate, while in animals destructive processes are more in evidence, since the animal utilizes as food the highly synthesized products of plants.

Reproduction.—The growth of an organism continues without interruption, so long as a suitable food supply is available, until a certain size or stage is attained, when reproduction occurs. In this process, the body divides into two or more individuals, instead of one, or it gives off smaller portions of itself, in the form of spores, buds, eggs, or other special reproductive bodies, capable of developing under suitable conditions into a form like that of the parent individual. So far as we know, living organisms never arise except as parts separated from previously existing living individuals. This is not to say, however, that this has always been the case. There may, indeed, have been a time when no living matter existed on the earth. If so, life must have had its beginning here either by the origin of living from previously lifeless matter, or by the introduction of living matter, through space, from some other world. Both views have their supporters, those who advocate the origin of life on the earth suggesting that it may have occurred when that planet was in a very different physical state from its present one.

Cellular Organization.—Plants and animals are alike in having bodies which are not homogeneous in structure but are made up of protoplasmic units called cells, comparable to the bricks of which a house is built. The simplest animals and plants have one-celled bodies, comparable to buildings of reinforced concrete cast in a single piece, but all the larger and more highly organized animals and plants have multi-cellular bodies, with cells of many different kinds, performing widely different functions, united in one co-operative organization. Thus in the human body, muscle cells, bone cells, blood cells, stomach cells, kidney cells, and others all perform their diverse functions under the general control of the brain and spinal cord composed of nerve cells. All these diverse cells are descendants of an original fertilized egg cell, the earliest recognizable stage in which the individual existed as a separate and distinct living creature.

Since the simplest of living creatures are one-celled and since in general all other living creatures begin their individual lives in a one-celled stage, it is supposed that the one-celled condition was primitive, and that multi-cellular animals and plants are of secondary origin.

A cell is a unit-mass of protoplasm capable, under suitable conditions, of performing the vital functions of metabolism, growth, and reproduction. It contains, usually, a central body known as a nucleus, which is indispensable to its continued existence, and which usually takes the initiative in cell division. In the nucleus is found an organized material, chromatin, which is believed to be the physical basis of heredity. The extra-nuclear portion of the cell is known as cytoplasm. In it the formed products of the cell arise, muscle and nerve fibres, cartilage, etc., in animals; starch grains, cellulose walls, etc., in plants. The special branch of biology devoted to the study of the finer structure of the cell is called *cytology.* (See CELL.)

Varieties of Reproduction.—The capacity for reproduction—*i.e.* the production of new individuals like the parent individual and derived from its own substance—has been mentioned as one of the most general and characteristic properties of living things. Reproductive processes are of the most varied kinds. In general, they may be distinguished as asexual and sexual. In asexual (or non-sexual) reproduction, the parent individual gives rise to new individuals by division of its own body either equally (as in fission and sporulation) or unequally (as in budding). Asexual reproduction is prevalent among the simpler forms of life, particularly the one-celled. It is the only form of reproduction known among bacteria, as well as among some other organisms either primitive or degenerate in character. For this reason it is supposed to have preceded sexual reproduction in the evolution of life.

Sexual reproduction consists essentially in the fusion of two reproductive cells, individuals or potential individuals, to form a single new individual. Among the one-celled animals and plants, where asexual reproduction is the common and habitual mode of multiplication, sexual reproduction may be resorted to in time of stress, when the food supply becomes insufficient, or the temperature or moisture conditions unfavorable. It is probable, indeed, that sexual reproduction originated under such conditions. It is a common device for organisms, when conditions are unfavorable for growth, to pass into a state of inactivity, becoming encysted or forming spores with thick resistant walls and dense protoplasmic contents containing little moisture. The seeds of flowering plants represent such a dormant stage, primarily adapted for carrying the species over unfavorable seasonal changes. In many groups of the lower animals and plants sexual reproduction is frequent in connection with the assumption of a dormant state. It is obvious that when unfavorable conditions are killing off the majority of the individuals in a species, a greater chance of survival is secured by such individuals as fuse in pairs, uniting their mass for the endurance of famine and becoming encysted in this form until the time of distress is over.

Sexual union occurs, even in the highest animals and plants, only between reproductive bodies in the one-celled stage. It must have originated among one-celled organisms and because of its obvious advantages been continued into the many-celled forms of life. Cells capable of sexual union are known as *gametes.* The fusion of two gametes to form a new individual is known as *fertilization*, and the new cell or individual which it produces is called a *zygote.* Gametes which unite in fertilization must, in general, be alike; that is, they must be of the same kind of living substance, belonging to the same species. Indeed, the ability of gametes to unite in fertilization has long been utilized to determine origin from individuals of the same species. As a test, however this is not entirely satisfactory, since some species will cross with each other, producing remarkably vigorous but completely sterile offspring. This is the case with the mule, product of a mare mated with an ass. If gametes are to produce fertile offspring, a certain degree of similarity is necessary. From recent studies it seems probable that the requirements are met when the chromosome number (see HEREDITY) is substantially the same in the uniting gametes, and these chromosomes contain many homologous genes and are capable of conjugation in pairs. A certain diversity between the uniting gametes is, however, obviously advantageous. Hence the superiority of cross fertilization over close or self fertilization among flowering plants and the advantages of outbreeding in animal husbandry. (See HEREDITY.)

Gametes have become differentiated in form among the higher animals and plants into two types, egg and sperm (pollen in the case of plants). The egg is a non-motile gamete in which or with which is deposited nourishment for the development of the new individual; the sperm is motile and travels light (without storage materials), carrying to the egg a new set of chromosomes and imparting to it the stimulus to development. The *dissimilarity* of gametes capable of union in fertilization makes for variability among later generations of the offspring, and this has undoubtedly been an important factor in the evolution of animals and plants.

Parthenogenesis is a form of degenerate sexual reproduction, in which the egg develops without the ordinary stimulus of fertilization. The inheritance is in this case purely maternal.

Sex.—The differentiation of individuals as male or female is a phenomenon distinct from the development of sexual reproduction, that is the origin of new individuals by fusion of gametes, for sexual reproduction may exist where individuals differentiated as male or female do not occur (see HERMAPHRODITE). Sexual individuals, males and females, are recognizable when an individual is restricted to the production of one kind of gamete, pollen *or* egg cell, but not both. Thus ash trees and poplar trees regularly produce only one type of gamete and are distinguishable either as male trees (pollen producers) or female trees (producers of egg cells and seeds). In all the higher animals (crustacea, insects, and vertebrates), male and female sexes are differentiated, but in most of the older (lower) animal groups hermaphroditism (production of both male and female gametes in the same individual) occurs very commonly, just as it does in flowering plants. In the flatworms, hermaphroditism is the rule; in the mollusca, it is common, but is complicated in some cases by the development of the male and female gametes at different periods of the animal's existence, a condition known as *successive hermaphroditism.* A comparable situation exists in cucumbers, squashes, and related flowering plants, which produce male and female blossoms on the same plant.

The condition of complete sexual separateness was probably preceded by hermaphroditism in the evolution both of the higher animals and of the higher plants. In both cases the advantage arising from cross fertilization probably favored the attainment of the sexually separate state, since in hermaphroditism self fertilization would naturally predominate unless prevented by the ripening of male and female gametes at different times in the same individual, or by some physiological device. Such devices are, in fact, common in perfect (hermaphroditic) flowering plants, resulting in self sterility. The pollen will not grow fast enough on the stigma of a flower of the same plant to secure fertilization of the flower. Thus, foreign pollen, which will grow faster, commonly effects fertilization and produces a seedling of greater vigor, because it is crossbred. In at least one species of hermaphroditic animal (*Ciona intestinalis*), a similar incompatibility between eggs and sperm produced by the same parent ensures the occurrence of cross fertilization, even when eggs and sperm are being produced simultaneously.

The sexually perfect or hermaphroditic condition is perpetuated in a species, like any other specific character, by heredity. The capacity inheres in every new individual to produce at maturity both male and female gametes in appropriate containers and with suitable efferent ducts or other secondary sexual characters. This does not violate the fundamental rule that like produces like. The same is apparently not true among sexually separate organisms. Here a male and a female parent produce offspring which are like one or the other in sex, but not both. One sex is invariably suppressed, the other fully expressed in the zygote. It has long been a source of speculation how this sexually separate condition is perpetuated, how sex is determined, why the sex character of one parent, rather than of the other, is expressed in the offspring.

The discovery of Mendel's law of heredity threw some light on this question, since in Mendelian inheritance (see HEREDITY) a character of one parent may dominate or suppress an alternative character of the other parent. The idea occurred to Mendel, and has since been more fully developed by others, that maleness and femaleness were inherited, among sexually separate organisms, as a pair of alternative Mendelian characters. But the difficulty remained to account for the failure of either sex state uniformly to dominate the other, since the offspring are as often of one sex as the other. At this point a fortunate discovery of the cytologists cleared up the mystery. The squash bug (*Anasa tristis*) was the first organism in which the mechanism of sex determination was definitely ascertained. Females of this species contain in the nucleus of each body cell twenty-two chromosomes (eleven pairs). This number is reduced in the mature egg to eleven, one representative of each pair. But males contain in each body cell twenty-one chromosomes (ten pairs and an odd one). The ten pairs correspond with ten pairs of the female; the odd one corresponds with one member of the eleventh pair of the female. The sperm cells formed by the male contain either ten or eleven chromosomes. A ten-chromosome sperm, on fertilizing the invariably eleven-chromosome egg, produces a male zygote ($10 + 11 = 21$, the characteristic male number). An eleven chromosome sperm, on fertilizing an egg, produces a female zygote ($11 + 11 = 22$, the characteristic female number). Sex determination, therefore, in this species, rests with the odd chromosome, one of which in a zygote makes it a male, two a female. In the other chromosomes, any genetic factors influencing sex are so evenly balanced (being equally represented in both sexes) that it remains for the odd chromosome to decide the issue.

In other animals and in the diœcious plants a similar (though in most cases slightly different) mechanism determines the sex of offspring. In man, as in the squash bug, there are produced two different kinds of sperm, as a rule in equal proportions and simultaneously, one kind being male determining, the other female determining. It follows in accordance with the laws of chance that about half the children born are boys and half girls, the sex of each child depending upon which kind of sperm takes part in its production. Environmental conditions, age of mother, etc., influence the result, if at all, in only a minor degree and indirectly.

In a few cases (birds and moths) the determination of sex depends upon the existence of two kinds of eggs, rather than two kinds of sperm. In such cases an odd chromosome, or an unlike pair of chromosomes, is probably present in the female, while the male contains only pairs of like chromosomes. This is strongly indicated by the breeding evidence, though the cytological evidence is at present less complete than in the cases previously mentioned, which are typical for most insects and for mammals.

Ontogeny.—In the higher forms of life, development from the egg (which is one-celled) is often a complicated process. The study of this process is the special field of embryology. In general, the succession of stages which occurs in the development of one of the higher animals is similar to the gradation of forms among its supposed ancestors. One of the best substantiated generalizations of biology is the so-called biogenetic law, that ontogeny (the development of the individual) is a repetition of phylogeny (the development of the race). In a general way this is undoubtedly a valid law, though a too literal interpretation would lead one into absurdities. Many embryological processes have probably no ancestral significance but are the consequence of mechanical necessity, while many ancestral modes of development have probably been dropped from ontogeny. The similarities which persist depend probably upon the similarity in structure of the eggs produced today to those produced anciently by the ancestors of existing species. Like eggs develop in like manner, though ages apart in time. (See EMBRYOLOGY.)

Evolution.—One of the major deductions of biology is the theory of organic evolution, which maintains that the organisms now existing on the earth are direct lineal descendants of other organisms of past geological ages. Where differences exist between present day organisms and their ancestors, those differences have originated gradually, as they are now originating, and have replaced earlier conditions because of their adaptive character, *i.e.* because their possessors were better adapted by their possession to the conditions of their existence. This in brief is the theory of organic improvement through 'natural selection,' or the 'survival of the fittest.' (See EVOLUTION.)

Because of the similarities between different forms of life, their common cellular organization, the similarity of their processes of metabolism, growth and reproduction, it seems rea-

NOTE: — *There are no pages 95–98.*

life' apart from the general metabolism of the body. Many of the wearisome obscurities in the discussion concerning the transmissibility of 'acquired characters' or 'modifications'—*i.e.* structural changes effected on the soma as the result of environmental or functional influence—are due to the lack of a sufficiently concrete appreciation of the facts of the case. Sometimes the germ-cells are set apart at an early stage in development; sometimes their distinct appearance is late; in either case they owe their peculiar power of reproducing to their retention of the original organization of the fertilized ovum. And though they may be strengthened or weakened by the general metabolism of the body, or even thereby prompted to vary, this fact is very different from the Lamarckian assumption that specific changes in the body can affect the germ-cells in a manner so specific and representative that the 'modifications' of the parent are transmitted to the offspring. See HEREDITY.)

Another result involved in body-making is *natural death.* We recognize at least three ways in which a full stop may be put to the life of an individual—(1) by some violent shock which shatters the organization, as when the grouse falls before the sportsman's gun; (2) by the poisons and lesions and blockages produced by intruding parasitic organisms, as when the grouse dies of grouse disease, known to be due to bacterial infection; (3) by the accumulation of physiological arrears or fatigue effects (especially in organs like brain, heart, and liver), which mount up until the organism, in a state of physiological insolvency, dies—a natural death. This consideration of the different modes of death brings **us** naturally enough to another problem—the continuance of life.

The Continuance of Life.—While it is characteristic of living organisms that they persist in spite of their ceaseless changes (metabolism), there are in most cases limits to this endurance. The structural effects of fatigue are not always removable by rest and food; arrears accumulate quickly or slowly according to the nature of the organism; eventually they become fatal in their amount, and the creature dies. It has been maintained that the unicellular animals are exempt from this natural death; their relative simplicity of structure makes complete recuperation possible, their capacity of regenerating injured portions is perfect, and their modes of reproduction are inexpensive. The so-called 'immortality of the Protozoa' suggests that reproduction should not be looked at as primarily an arrangement securing the persistence of a mortal race, for reproduction is more primitive than death, and is indeed one of its frequent causes.

Here the biologist has to face the problem presented by the different modes of reproduction: (*a*) asexual, when a portion of the parent organism, whether continuous or discontinuous, grows into or reproduces a unit-whole, more or less like the parent, as in the budding hydra or the fragmenting sea anemone, the gemma-producing liverwort or the bulbil-making tiger-lily; (*b*) sexual, when there are definite egg-cells or ova, and sperm-cells or spermatozoa. This scheme is complicated by the occurrence of a degenerate form of sexual reproduction (parthenogenesis), when ova develop without fertilization by sperm-cells; and by the occurrence of alternations of sexual and asexual reproduction, as in the life-history of many zoophytes, or of most of the fernlike plants. Starting with the growing cell—where the increase of mass tends to outrun its increase of surface—the biologist has to endeavor to explain what 'the limit of growth' means, and to show that the reproduction which so often ensues at the limit is in its simplest expressions a mode of discontinuous growth. Experimental work shows that a non-nucleated fragment of a protozoon will for a time move and respond to stimuli, but does not feed or grow; which goes to show that what is essential in reproduction is that the separated portion or portions should have the characteristic organization of the parent organism. And this leads us again to the important general idea of 'gentle continuity'—the idea that the germ-cells have their particular power of reproducing because they are the unmodified, unspecialized lineal descendants of the germ-cells which gave rise to the parent organism.

It is especially to Virchow (1858) that biology owes the conception 'of an uninterrupted series of cell divisions, extending backward from existing plants and animals to that remote and unknown period when vital organization assumed its present form. Life is a continuous stream. The death of the individual involves no breach of continuity in the series of cell divisions by which the life of the race flows onwards. The individual body dies, it is true, but the germ-cells live on, carrying with them, as it were, the traditions of the race from which they have sprung' (E. B. Wilson).

Fertilization.—The study of reproduction must include an inquiry into the origin and meaning of fertilization. As to the former, the flowing together of many cells to make a 'plasmodium,' the union of three or four in 'multiple conjugation,' the ordinary conjugation of two apparently similar units, and the union of slightly dimorphic cells are possible stages, leading towards what is certainly typical both in animals and plants—the union of a minute active spermatozoon with a relatively large passive ovum. As to the meaning of the process, there are, in the first place, many facts which suggest that the nuclei are the chief bearers of the hereditary qualities of the (usually) two parents; and, in the second place, there are other facts which suggest that the entrance of the spermatozoon supplies some dynamic stimulus, which prompts to division. In many cases it has been shown that, besides the nucleus, the spermatozoon brings into the ovum a minute corpuscle called the centrosome, which seems to play an important part in the segmentation which follows. Of much interest also is the process of maturation which precedes fertilization; in that process the number of nuclear elements or chromatin bodies in the egg-cell and in the sperm-cell is reduced, so that after fertilization the number which is characteristic of the species is still present.

In 1878 Huxley wrote: 'It is conceivable, and indeed probable, that every part of the adult contains molecules derived both from the male and from the female parent; and that, regarded as a mass of molecules, the entire organism may be compared to a web, of which the warp is derived from the female and the woof from the male.' This has been confirmed by subsequent research, and has been rendered more precise by the evidence, which goes to show that a very important part of the web is represented by the chromatin substance of the nuclei. The modern interpretation is thus summed up by Prof. E. B. Wilson: 1. From the mother comes, in the main, the cytoplasm of the embryonic body, which is the principal substratum of growth and differentiation. 2. From both parents comes the hereditary basis or chromatin by which these processes are controlled, and from which they receive the specific stamp of the race. 3. From the father comes the stimulus inducing the organization of the machinery of mitotic division, by which the egg splits up into the elements of the tissues, and by which each of these elements receives its quota of the common heritage of chromatin.

Sex.—The biologist finds another series of problems in the facts of sex. Of two eggs in a nest, one will develop into a male, the other into a female; what is the difference between the eggs, and their development, and their final result? Is it that the animate mechanism which we call an organism has, so to speak, two grades of gearing, and that one or the other may be fixed by environmental influences acting on the germ-cells, or on the embryos, or in some cases (*e.g.* tadpoles) even on the larvæ? Is there one constitutional and fundamental difference, which we compare to a difference in gearing, which finds expression in the hundred and one differences in structure and habit which so often distinguish male from female? That every germ-cell has a complete specific inheritance — potentially complete for either sex—seems obvious enough from cases like that of drone bees, who, though males, have no father; but how are we to conceive of the process by which male characteristics find expression in the development of one germ-cell, and female characteristics in another, or both in a third (hermaphroditism)? From these fundamental questions, still far from answerable, the biologist will pass to the adaptive relations of one sex to another and to functions that are characteristic of each, to the problem of preferential mating and sexual selection, and so on along an ever-lengthening radius.

Development.—Let us suppose that the biologist has become in some measure clear that an egg-cell is able to reproduce an organism like the parent, in virtue of its genetic continuity with the fertilized egg-cell which gave rise to that parent; that he has interpreted the fertilization of the egg-cell (*a*) as an intimate and orderly union of maternal and paternal heritages (tending, on the one hand, to insure specific constancy, and yet, on the other hand, to prompt variations), and (*b*) as also implying a stimulus to that cleavage or segmentation with which all development begins. He has still before him the problems presented by each and every process of development. Out of the apparently simple there emerges the obviously complex; each stage seems to condition its successor, but the actual nexus of events is obscure. How much of the process is the unfolding of a preformed organization, how much of it is due to the reciprocal action of cells, and to the reaction of the whole embryo to its environment? How is a fit statement to be made of the fact that one of the first two cells into which an egg (*e.g.* of the frog) divides will in certain circumstances develop by itself into a one-sided embryo, and in other circumstances into a half-sized complete embryo? Again, while it seems fairly clear that the maternal and paternal contributions which come together in fertilization form the warp and woof of the developing embryo, and that the little body—called the centrosome—which the spermatozoon brings into the egg along with the paternal heritage behaves like the weaver at the loom, how are we to interpret the fact that in the final result the hereditary resemblance is sometimes almost exclusively to one parent and sometimes an average between the two? Or, again, how is a generalization to be framed which will recognize, on the one hand, the tendency of the individual development to recapitulate the racial evolution, and, on the other hand, the fact that there are specific peculiarities which are capable of being detected almost from the first? In the life-history of the frog there are hints of a recapitulation of ancestral piscine stages, and yet, from the beginning and throughout, the developing organism is distinctly amphibian.

Heredity.—The problems of development are closely united to those of heredity, or the relation of genetic continuity between successive generations. This relation has its visible material basis in the germinal matter of the ova and sperm-cells, and what most distinguishes the modern conception of the germ-cells is a recognition of their continuity in character and organization with the germinal material from which the parent arose. It is to this continuity that they owe their power of developing into organisms like the parents.

While there tends to be a great completeness in the expression of what may be called the specific inheritance—like tending to beget like—the completeness of hereditary resemblance is only approximate. Thus the biologist is brought to face the problem of variations—*i.e.* inborn or congenital differences within a species as distinguished from differences due to 'modifications' or the structural effects on the body induced by changes in the functional and environmental influences. The former are heritable or transmissible, but this has not been proved for the latter.

The biologist has also to study the expression of the offspring's inheritance in relation to the characteristics of the two parents; it may be a blend, or it may be unilateral, or it may be a combination without being a blend. The inheritance is normally dual, but the contributions from the two parents may not find equal expression; moreover, since the inheritance of each parent was also dual, and so on backwards, an inheritance is in a strict sense mosaic or multiple, made up, as it were, of contributions from many ancestors. The problems become yet more complicated when the facts of filial regression, atavism, and reversion are considered. For some higher animals, and notably for man, it is likewise necessary to take account of what may be called the external as opposed to the organic heritage—the influence, in other words, of traditions, customs, and the like. Here biology is linked to comparative psychology and sociology.

Evolution.—The largest problems which the biologist raises are those of organic evolution. A survey of plants and animals discloses a maze of relationships to which here and there the genetic clue has been found; in a few cases a more than plausible genealogical tree has been constructed One species seems often to merge with another, as nebula with nebula in the heavens; even when the central or more typical forms in two or three related groups seem distinct enough, there are outliers which might equally well be affiliated to any one of the three sets. Even genera may be arranged in series, which seem to represent successive steps of progress, or it may be of retrogression; and there are not wanting 'synthetic types' or 'connecting links' uniting stocks which would otherwise appear quite discontinuous. An anatomical survey shows us the same material of bone, muscle, and nerve twisted and fashioned into manifold forms —*e.g.* in the fore or hind limbs of vertebrates—and the persistence of vestigial structures in organisms where they seem of little moment or relevancy, though they are essential organs in other organisms of lower degree. Another survey shows the plasticity of the organism, as an individual under the moulding influences of environment and functions, and as a race when we compare with precision the members of successive generations. The rock or geological record, extending back for many millions of years, shows the gradual emergence of higher and higher forms of life (higher as judged by the twofold standard of differentiation and integration), and affords the sublime spectacle of races gradually attaining a climax and then waning into extinction. And again, the study of development shows in a few days or weeks or months an individual progress from the fertilized egg-cell to the finished form —a process in which each step seems to condition and determine the next, in which obvious complexity is evolved from apparent simplicity. A survey of these different sets of facts has led to the formulation of the general evolution idea, that the present is the child of the past and the parent of the future, that the forms of life around us have been derived by long-continued processes of change from ancestors on the whole simpler and more generalized. The evolution formula suggests a mode of origin, a process of becoming, a progress, or it may be in some cases a retrogression, from one established order of being to another; and it owes much of its cogency to the fact that it appears to be applicable to all orders of facts—from the solar system to human institutions. It cannot be exactly demonstrated, as the doctrine of the conservation of energy may be, but it is justified, like the conception of the ether in physics or the atomic theory in chemistry, by its utility as a thought-economizing general formula, unifying a multitude of facts, and contradicted by none.

But while the general idea (or, as some would say, fact) of evolution is all but unanimously accepted by biologists—and it is the only scientific interpretation in the field—there is great uncertainty in regard to the factors in the process.

These factors may be distinguished as primary and secondary. Originative factors are those that induce hereditary changes or variation; the secondary or directive factors are those that operate upon the raw material afforded by the first. As to the first, precise inquiry is only beginning, for we know almost nothing in regard to the causes of variation, and relatively little in regard to their nature and amount. It may be that environmental and functional changes affecting the body also exert an influence on the complex germinal material; it may be that the processes of maturation and fertilization induce new permutations and combinations of molecules in the material basis of inheritance; and it may be that environmental influences act directly on liberated germ-cells before fertilization occurs. But it is premature to make any definite statement. Researches into the actual occurrence of variations show that they are very frequent, that they are sometimes 'saltatory,' 'transilient,' or 'discontinuous'—that is, as it were, leaps to a new position of organic equilibrium—and that they are sometimes slow and gradual, like stages of growth or phases in development; that they are sometimes genuinely new departures, often describable as 'freaks' or 'sports,' and that they are often 'definite,' expressing a little more or less of one of the parental or specific characteristics; that they are sometimes apparently particulate, affecting one part or organ of the body, and sometimes more general, as if the organism varied as a whole and not piecemeal. But many years of work will be necessary before general statements as to the nature of variations can be made with anything like safety.

In actual practice, the biologist has to begin by recording the observed differences between members of a species, say of crab and buttercup. Then must follow an attempt to discriminate between those differences which can be demonstrably described as due to 'modifications' (bodily changes due to diversity in the environment or function of the organisms) from those which cannot be so regarded, and are therefore interpreted as the outcrops of germinal variations. If it be true that the former do not in any specific or representative manner affect the inheritance, then they can have no more than an indirect effect in evolution. But this question is still much discussed. As to the secondary or directive factors which operate upon the raw material afforded by variability, there are as yet only two which will stand much testing—*viz.* natural selection and isolation.

The first is a result of what is called, 'in a wide and metaphorical sense,' as Darwin said, the struggle for existence. From two parents many offspring usually arise; the conditions of existence put limits to the increase of population, and some form of struggle ensues. There is competition between fellows of the same kin—*e.g.* between rats, between locusts, between seedlings in a plot—competition for food, for standing-room, for mates, and so on; and there is the struggle between the variable organism and its inanimate environment, which is also variable. Similarly, there may be struggle between ova and between spermatozoa; the conception is all-embracing. It varies infinitely in its form and intensity; but wherever the effectiveness of vital response to given conditions is of critical moment, there natural selection operates. The relatively less fit tend to be eliminated, to have shorter, less successful lives, to have fewer and less vigorous offspring, and so on. The relatively more fit (which need not mean *higher*) tend to survive; and if the relative degrees of fitness depend on germinal variations (by hypothesis inheritable), there results a process of racial evolution.

The second directive factor on which some reliance may be placed is expressed in the term isolation, which includes a variety of ways in which free intercrossing between members of a species is prevented—*e.g.* by geographical barriers, by change of habit, by a reproductive variation causing mutual sterility between two sections of a species living on a common area, and so on. The importance of this factor becomes evident when we consider that without some form of isolation—corresponding to one part of the breeder's procedure—particular variations of small amount would tend to be lost or neutralized by intercrossing. But although Romanes went the length of saying that 'without isolation, or the prevention of free intercrossing, organic evolution is in no case possible,' there is still a lack of sufficiently precise evidence in regard to the alleged swamping of new variations when there is no isolation, and in regard to the supposed general prevention of free intercrossing.

In regard, then, to the factors of organic evolution, as in regard to the other difficult problems of metabolism and growth, differentiation and integration, reproduction and sex, development and heredity, biology has still to wait awhile for its foundation-stones. The outlook is, however, hopeful, especially when we consider the rapidly-increasing body of workers, the improvements in method, the more frequent recourse to experimental tests, the growing tendency to the correlation of different lines of inquiry and of the different sciences, and the dominance of the critical mood.

Some biological classics:—Carl Ernst von Baer, *Ueber Entwickelungsgeschichte der Thiere: Beobachtung und Reflexion* (1828–37); Charles Darwin's *Origin of Species* (1859; new ed. 1902), *Descent of Man* (1871; new ed. 1901), *Variation of Plants and Animals under Domestication* (1868); Goethe's *Zur Morphologie* (1790), etc.; Ernst Haeckel's *Generelle Morphologie* (1866); Lamarck's *Philosophie Zoologique* (1809); Fritz Müller's *Für Darwin* (1864); M. J. Schleiden's *Beiträge zur Phytogenesis* (1838; trans. 1847); Th. Schwann's *Mikroskopische Untersuchungen* (1839; trans. 1847); Herbert Spencer's *Principles of Biology* (1864–66); R. Virchow's *Die Cellularpathologie* (1858).

Some works discussing the general problems of biology:—W. K. Brooks's *Foundations of Zoology* (1894); Ernst Haeckel's *Generelle Morphologie* (1866); C. Lloyd Morgan's *Animal Behavior* (1900), new ed. of *Animal Life and Intelligence* (1890–1); Karl Pearson's *The Grammar of Science* (new ed. 1900); Herbert Spencer's *Principles of Biology* (1864–6); J. A. Thomson's *The Science of Life* (1899); M. Verworn's *General Physiology* (trans. 1899); J. Ward's

Naturalism and Agnosticism (1899); A. Weismann's *The Germ-Plasm* (1893).

Some text-books of zoology:—C. Claus's *Grundzüge der Zoologie* (4th ed. 1880–2); Hatchett Jackson's edition of G. Rolleston's *Forms of Animal Life* (1888); T. H. Huxley's *Anatomy of Invertebrated Animals* (1877), and *Anatomy of Vertebrated Animals* (1871); Ray Lankester's *Treatise on Zoology* (in progress, 10 vols. 1900, etc.); T. J. Parker and W. A. Haswell's *Text-book of Zoology* (2 vols. 1897).

Some text-books of botany:—A. B. Frank, *Lehrbuch der Botanik* (1892); Kerner von Marilaun, *Pflanzenleben* (1887 and 1891, also an English translation); F. Ludwig's *Lehrbuch der Biologie der Pflanzen* (1895); J. von Sachs's *Text-book of Botany* (2nd ed. 1883); W. Pfeffer's *Pflanzenphysiologie* (1897); Strasburger, Noll, Schenck, and Schimper, *A Text-book of Botany*, trans. by Porter (1898); S. H. Vines's *Student's Text-book of Botany* (1895).

General morphology:—Herbert Spencer's *Principles of Biology* (1864–6; first volume revised, 1898); Ernst Haeckel's *Generelle Morphologie* (1866)—a scarce classic. See also W. His, *Unsere Körperform* (1874); G. Jaeger, *Allgemeine Zoologie* (1878); P. Geddes's article 'Morphology,' *Encyc. Brit.*; Bronn's *Morphologische Studien* (1858); treatises on Comparative Anatomy of Animals, by Gegenbaur (trans. 1878; in process of re-ed.); Wiedersheim (trans. of 2nd ed. 1897); and the older works of Owen and Huxley. Compare also K. von Zittel's *Text-book of Palæontology* (trans. and re-ed. 1900); Hatchett Jackson's ed. of G. Rolleston's *Forms of Animal Life* (1888).

General physiology:—Max Verworn's *General Physiology* (trans. 1899); Claude Bernard's *Leçons sur des Phénomènes de la Vie commune aux Animaux et aux Végétaux* (1878); C. B. Davenport's *Experimental Morphology* (1897 and 1899, in progress).

Comparative physiology:—Jeffrey Bell's *Comparative Anatomy and Physiology* (1887)—an excellent introduction; C. F. W. Krukenberg's *Vergleichend-physiologische Studien und Vergl.-Physiol. Vorträge* (1881–9); A. B. Griffiths's *Comparative Physiology* (1891); W. D. Halliburton's *Essentials of Chemical Physiology* (4th ed. 1901); M. I. Newbigin's *Color in Nature* (1898).

Embryology:—F. M. Balfour's *A Treatise on Comparative Embryology* (1880–1)—a classic work, but now requiring to be corrected by more recent investigations; Sir M. Foster and F. M. Balfour's *Elements of Embryology*, revised by Sedgwick and Heape (1883)—mostly occupied with the development of the chick; O. Hertwig's *Embryology of Man and Vertebrates* (trans. 1893); Korschelt and Heider's *Embryology of Invertebrates* (trans. 1895); A. Milnes Marshall's *Vertebrate Embryology* (1893); C. Sedgwick Minot's *Human Embryology* (1892); A. C. Haddon's *Introduction to the Study of Embryology* (1887); L. Roule's *Embryologie Générale* (1893), and *Embryologie Comparée* (1894); Bergh's *Allgemeine Embryologie* (1895).

For discussion of the general theory of development, see O. Hertwig's *The Biological Problem of To-day* (trans. 1896), and W. Roux's *Gesammelte Abhandlungen über Entwicklungsmechanik der Organismen* (1895).

Palæontology:—H. A. Nicholson and R. Lydekker's *Manual of Palæontology* (2 vols. 1889); K. A. von Zittel's *Text-book of Palæontology* (trans. by C. R. Eastman, vol. i. 1900); Gaudry's *Les Enchaînements du Monde Animal* (1888–90); M. Neumayr's *Die Stämme des Thierreichs* (vol. i. 1889); also text-books by Bernard, Hoernes (1886), Koken (1882), Steinmann and Döderlein (1890), etc.

Ætiology:—The works of Darwin, Wallace, Spencer, Haeckel; W. Bateson's *Materials for the Study of Variation* (1894); Samuel Butler's *Evolution, Old and New* (1879); E. D. Cope's *Origin of the Fittest* (1887); *The Primary Factors of Organic Evolution* (1896); G. H. Th. Eimer's *Organic Evolution* (trans. 1890); P. Geddes's article 'Variation and Selection,' *Encyc. Brit.;* J. T. Gulick's 'Divergent Evolution through Cumulative Segregation,' *Jour. Linnæan Society* (vol. xx. 1888, etc.); St. George Mivart's *The Genesis of Species* (1871), *Lessons from Nature* (1876), etc.; C. von Nägeli's *Mechanisch-physiologische Abstammungslehre* (1884); K. Pearson's *The Chances of Death* (1897); *The Grammar of Science* (new ed. 1900); G. T. Romanes's 'Physiological Selection,' *Jour. Linnæan Society* (vol. xix. 1886); *Darwin and after Darwin* (3 vols. 1892–7); Karl Semper's *The Natural Conditions of Existence as they affect Animal Life* (1881); H. de Varigny's *Experimental Evolution* (1892); M. Wagner's *Die Entstehung der Arten durch räumliche Sonderung* (1889); A. Russel Wallace's *Darwinism* (1889); A. Weismann's *The Germ-Plasm* (1893) and *The Evolution Theory* (trans. 1904).

Protoplasm:—For full and critical discussion and bibliography, E. B. Wilson's *The Cell in Development and Inheritance* (2nd ed. 1902); Yves Delage's *La Structure du Protoplasma*, etc. (1895). For physiological aspects in particular, Max Verworn's *General Physiology* (trans. by Lee, 1899); a valuable address by Sir J. S. Burdon-Sanderson, *Nature*, xl., Sept., 1889, pp. 521–526, and Rep. Brit. Association for 1889; and three articles in the *Encyc. Brit.*—'Physiology' (Sir Michael Foster), 'Protoplasm' (P. Geddes), 'Protozoa,' large type (E. Ray Lankester).

For philosophical discussion, see T. H. Huxley's famous address, 'Protoplasm: the Physical Basis of Life' (in his *Collected Essays*); Hutchison Stirling's *As Regards Protoplasm* (1872); the chapter 'Vitalism' in Bunge's *Physiological Chemistry* (trans. 1890).

The cell:—Of great value in itself and in its bibliography, E. B. Wilson's *The Cell in Development and Inheritance* (2nd ed. 1902). See also R. S. Bergh's *Vorlesungen über die Zelle* (1894); Y. Delage, *op. cit.* (1895); L. F. Henneguy's *Leçons sur la Cellule* (1896); O. Hertwig's *Die Zelle und die Gewebe* (1893 and 1898, the first part trans. 1895). Two important initial works in histological analysis were Leydig's *Lehrbuch der Histologie des Menschen und der Thiere* (1857), and E. W. von Brücke's *Elementarorganismen* (new ed. 1898). For instruction as to the practical study of cells, the work of V. Haecker, *Praxis und Theorie der Zellen- und Befruchtungs-Lehre* (1899) can be strongly recommended.

Reproduction and sex.—A convenient introduction, with bibliography, will be found in *The Evolution of Sex* (revised ed. 1901), by P. Geddes and J. A. Thomson; Darwin's *Descent of Man* (new ed. 1901). See also A. Weismann's papers on heredity and kindred subjects (trans. 1889); J. Cossar Ewart's *The Penycuik Experiments* (1899); J. T. Cunningham's *Sexual Dimorphism* (1900), with Lamarckian interpretation.

Heredity:—Yves Delage's *La Structure du Protoplasma, l'Hérédité*, etc. (1895); Francis Galton's *Natural Inheritance* (1889); Prosper Lucas's *Traité Philosophique et Physiologique de l'Hérédité Naturelle* (1847); Th. Ribot's *L'Hérédité Psychologique* (new ed. 1882); H. de Vries's *Intracellulare Pangenesis* (1889); A. Weismann's *Essays on Heredity* (trans. 1889), and *The Germ-Plasm* (1893); E. B. Wilson's *The Cell in Development and in Inheritance* (2nd ed. 1902); J. A. Thomson's *Heredity* (1904).

Animal instincts and intelligence:—J. Loeb's *Comparative Physiology of the Brain and Comparative Psychology* (trans. 1901), illustrating the extreme physiological position; E. Mach's *Contributions to the Analysis of the Sensations* (trans. 1897); C. Lloyd Morgan's *Introduction to Comparative Psychology* (1894); *Animal Life and Intelligence* (1890–1), re-ed. as *Animal Behavior* (1900);

sonable to suppose that all forms of life have been derived by descent from one primitive form. But there is no certain proof of this. It may be that the earliest forms of life to originate were similar even when those origins were separated in time and space. Historically we have conclusive evidence in fossils that certain forms of life have descended from a common ancestor, as for example all vertebrates or all flowering plants. But there are so many gaps in the geological record that we can not state it as a certainty that vertebrates and flowering plants have descended along divergent lines from one and the same original form of life, much as the two have in common in their fundamental life processes. Notwithstanding all uncertainties, the theory that all organisms are derived by descent with modification from a single or a few primary forms of life renders intelligible the present multiplicity of organic forms and their interrelations, as does no other theory yet suggested.

In connection with the preceding general outline of Biology the reader is referred to the following articles in this work:

Adaptation
Alternation of Generations
Cell
Colors of Animals
Egg
Embryology
Environment
Evolution
Feritlization
Heredity
Hybrid
Mendel's Law
Metabolism
Mimicry
Parthenogenesis
Phylogeny
Protoplasm
Reproduction
Sex
Variation

See also the biographies of such biologists as Buffon, Cohn, Darwin, Huxley, and Lamarck. Consult Charles Darwin's *Origin of Species;* Huxley's essay *On the Study of Biology;* Karl Pearson's *The Grammar of Science* (1911); L. L. Woodruff's *Foundations of Biology* (1922); E. B. Wilson's *The Cell in Development and Inheritance* (3d ed. 1925).

Biom'etry, a term applied to that branch of science which deals with vital phenomena from the quantitative or statistical point of view. It involves methods of exact measurement, on the one hand, and precise and refined mathematical analyses on the other. Its fundamental point of view is that without a study of the quantitative relations of biological phenomena in the widest sense, it will never be possible to arrive at a full and adequate knowledge of those phenomena. The study of Vital Statistics is that special branch of biometry which concerns itself with the data and laws of human mortality, morbidity, natality, and demography. As a definitely recognized branch of biological science biometry owes its origin primarily to the work of Sir Francis Galton and Professor Karl Pearson. See BIOLOGY.

Bion, bī'on, a poet of the Alexandrian period of Greek literature, a contemporary of Theocritus, and the friend and master of Moschus, who wrote an elegy on him. He was born at Smyrna, but spent his last years in Sicily. His poems are of the class called bucolic, but deal chiefly with the loves of gods and heroes. The best known is the *Epitaph of Adonis.*

Bion OF BORYSTHENES (*c.* 250 B.C.), Greek Cynic philosopher, a contemporary of Eratosthenes and Zeno, studied and taught at Athens. Of his trenchant satires, only fragments remain, edited by Mullach (1867).

Biondi, bē-on'dē, GIOVANNI FRANCESCO (1572–1644), Italian romance writer, was born in Lesina, off Dalmatia, and was successively in the diplomatic service of Venice and Great Britain. He wrote *An History of the Civil Warres of England* (trans, 1641) and three romances, *Eromena* (1624, trans. 1632), *La Donzella Desterrada* (1627, trans. 1635), and *Il Coralbo* (1635, trans. 1655), which were very popular in English translations.

Bionom'ics ('laws of life'), a term suggested by Professor E. Ray Lankester to designate the study of the external life of plants and animals, their interrelations with other individuals, and their adaptations to their organic and inorganic environment. The importance of considering the organism, not as an isolated existence, but as a link in the great chain of living creatures, was first fully realized by Darwin, and his volume on *Earthworms* (1881) may be taken as a typical example of a bionomical investigation. See BIOLOGY. Consult J. A. Thomson's *Science of Life.*

Biot, JEAN BAPTISTE (1774–1862), French physicist, was born in Paris. He was appointed to the professorships successively of mathematics at Beauvais, of physics at the Collège de France, Paris, in 1800, and of physical astronomy at the Faculté des Sciences in 1809. He experimented on the refractivity of gases in 1803, joined Arago in measuring an arc of the meridian in Spain in 1806, and determined the length of the seconds pendulum along a British arc in 1817–18. He invented the polarimeter and in 1840 was awarded the Rumford medal for his researches on polarized light. He published valuable treatises on Curves (1802), on Physical Astronomy (1805), on Physics (1816–17), and on Egyptian Astronomy (1823). He died in Paris.

Bi'otite, or BLACK MICA, a mineral belonging to the mica group, but distinguished from other micas by its black color and by the presence of considerable proportions of magnesia and iron. It is a common and important rock-forming mineral, occurring in most granites, gneisses, schists, and in a great variety of crystalline rocks. It is also present as small flakes in many soils. When fresh it forms black, shining spangles, with a brilliant surface, and is easily recognized by its softness (it may be scratched like a piece of paper), and by its perfect cleavage, in consequence of which it breaks up into thin, smooth scales. It may be distinguished under the microscope from the darker colored muscovite and phlogopite by its small axial angle, which often renders it sensibly uniaxial.

Biplane. See FLYING MACHINES.

Biquadratic (Lat. *biquadratus* = twice squared), an equation involving the fourth power of the unknown quantity—*i.e.* of the form $x^4 + px^3 + qx^2 + rx + s = 0$ where p, q, r, and s are constants. A biquadratic can sometimes be reduced to a quadratic, as, for instance, when it happens to be a perfect square, or can be reduced to the form $x^2(x + a)^2 + bx(x + a) + c = 0$. In other cases it may be solved by means of an auxiliary cubic, by Descartes', Ferrari's, or Euler's method, unless the roots are all real or all imaginary, when the cubic equation has generally real and unequal roots.

Bir, bēr, or BIREJIK, town, Asiatic Turkey, on the left bank of the Euphrates, 80 miles northeast of Aleppo. It is the limit of Euphrates navigation and the former crossing point of the great caravan route between Syria and Mesopotamia. Pop. over 10,000.

Birbhum, bēr-bo͞om', district, Bengal, India, with an area of 1,752 square miles. The climate is dry and healthful. Rice, mulberries, sugar cane, and maize are grown. Cotton and silk are manufactured. Pop. 905,000.

Birch, a tree belonging to the genus *Betula,* of the family Betulaceæ. The birches, of which there are some twenty-eight species, are distributed throughout the Northern Hemisphere, ten species occurring in North America and some being found as far north as Greenland. The tree has a smooth bark, usually curling back in thin horizontal layers; ovate, serrate leaves; monœcious flowers borne in catkins, and cone-like fruit. In most species the wood is rather inferior, but if the tree is stripped of its bark as soon as it is felled, the timber is considerably improved in durability. In the north of Europe birch is used for fuel in houses and smelting works; it furnishes good charcoal; the Russians use it for shoes, utensils, and furniture, and its bark yields tannin, a yellow dye, and an oil which gives Russian leather its characteristic color and odor.

The American White Birch (*B. populifolia*), of the Northeastern United States, is a small, graceful tree, about 30 feet in height, with slender horizontal branches and tremulous foliage. The bark is a chalky white or gray color, not easily separated into layers. The wood is useful for pulp, shoe pegs, and spools. The Yellow Birch (*B. lutea*) is a tall tree (70 to 80 feet) growing in damp woods in the Northern States and Nova Scotia. Its wood, close grained and hard, is valuable for furniture, fuel, and boxes. Perhaps the most famous American birch is the Paper or Canoe Birch (*B. papyrifera*), a tall tree (70 feet), with a laminated bark, the outer layers being chalky white, the inner of a pink tinge. The outer layers of bark peel off in thin, curling strips as the trunk grows. The American Indians stretched this supple, waterproof bark over light wooden frames, and sewed it with split spruce roots, to make their canoes. It was also used by them for baskets, as a substitute for paper, and for various utensils. The yellow and paper birches are sometimes known as Silver Birch. The Common European Birch (*B. alba*) is also a white-barked tree, which is commonly cultivated, especially in its 'weeping' form. The thin silvery cuticle, which scales off like slips of paper, was once used for writing paper, and the enduring character of the bark has long been known. The Laplanders use it as a houseroofing material.

Photo from A. T. De La Mare Co.

American White Birch (*Betula populifolia*)

Other common species are the Black or Red Birch (*B. nigra*), valuable for furniture, small woodenware, and fuel, and the Cherry Birch or Sweet Birch (*B. lenta*), a handsome tree whose wood is stained to imitate cherry or mahogany and from the bark of which is extracted the wintergreen oil used in flavoring medicines.

Birch, SAMUEL (1813–85), English Egyptologist, was born in London. After studying Chinese, he became in 1836 assistant in the department of antiquities at the British Museum, and from 1866 till his death was keeper of Oriental antiquities. He was one of the founders of the Society of Bible Archæology (1870). His published works include: *History of Ancient Pottery* (1858; 2nd ed. 1873), *Ancient History from the Monuments: Egypt* (1885), and descriptions of the Greek Vases (1851), Ancient Marbles (1861), Rhind Papyri (1866), Hieratic and Demotic Inscriptions (1868), and other collections in the British Museum. Consult *Life*, by his son.

Birch, THOMAS (1705–66), English historian and biographer, was born of Quaker parents in Clerkenwell, London. He took orders in the Anglican Church in 1731, and under the patronage of the Hardwicke family was rapidly preferred, until, in 1746, he became rector of St. Margaret Pattens, London. He was secretary of the Royal Society from 1752 to 1765. His principal works were *Life of Robert Boyle* (1744), *Memoirs of the Reign of Elizabeth, 1581–1603* (1754), and *Historical View of Negotiations between the Courts of England, France, and Brussels, 1592–1617* (1749).

Birch Creek, river, Alaska, rises in the gold fields south of the Crazy Mountains, flows around them and northward to its confluence with the Yukon near the Arctic Circle.

Birch-Pfeiffer CHARLOTTE (1800–68), German actress and dramatic writer, was born in Stuttgart and made her début in her early 'teens. In 1825 she was married to Dr. Christian Birch, a Danish historian, and prefixed his name to her maiden name of Pfeiffer. From 1837 to 1843 she was manager of the theatre at Zürich, and in 1844 accepted an engagement at the Theatre Royal, Berlin, where she continued to play until the end of her life. She was a prolific playwriter and novelist, her plays being still popular in Germany, especially *Die Günstlinge*, *Hinko*, *Die Waise von Lowood* (a dramatization of Charlotte Brontë's *Jane Eyre*), and *Pfefferrösel*. Her collected dramatic works, in German, appeared in 23 volumes (1863–80), and her novels in 3 volumes (1863–5).

Bird, ARTHUR (1856–), American composer, was born in Cambridge, Mass., the son of a well known teacher of music. He studied music under leading masters in Germany, and after filling positions as organist and choir-master of the Kirk, Halifax, N. S., again visited Europe, spending the years 1885-6 in Weimar with Liszt, who encouraged his work in composition. His first public concert was given in Berlin, 1886, where he made his permanent residence. He is a member of the National Institute of Arts and Letters. His compositions include his *Carnival*, for the orchestra, *Symphony in A Major*, ten compositions for the organ, and pieces for the piano, songs, etc.

Bird, EDWARD (1772-1819), English subject painter, was born at Wolverhampton, and educated himself. In 1809 the Royal Academy accepted his *Good News*, which at once established his reputation. Other genre paintings, *County Auction* and *Gipsy Boy*, were equally successful; his *Village Politicians* and *Blacksmith's Shop* are well known. He was elected A.R.A. in 1812, and R.A. in 1815. For the *Death of Eli* he was awarded the prize of the British Institution; and by the *Field of Chevy Chase*, his greatest work, he procured the post of court painter to Queen Charlotte. His last historical piece was the *Embarkation of Louis XVIII. for France*. See A. Cunningham's *Lives of the Most Eminent British Painters* (1879-80).

Bird, FREDERIC MAYER (1838-1908), Amer. clergyman, son of R. M. Bird, born in Philadelphia, Pa., and graduated (1857) at the University of Pennsylvania. He was ordained a Lutheran minister, and served as chaplain in the Civil War. He afterward took orders in the Protestant Episcopal church, and was rector of churches in Spotswood, N. J., and Bethlehem, Pa. Mr. Bird became a leading authority on hymnology, and was co-editor of several collections of hymns. He was for several years professor of psychology, Christian evidence and rhetoric at Lehigh University, did much encyclopædia work, and was editor of *Lippincott's Magazine*, 1893-8. Author of *The Story of Our Christianity* (1893).

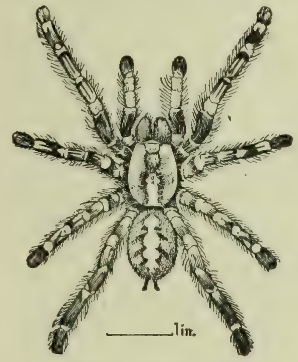
Bird, ISABELLA. See BISHOP.

Bird, ROBERT MONTGOMERY, (1805-54), American author, was born at New Castle, Del. He early turned his attention to literature, and wrote three successful tragedies—*The Gladiator* (a favorite piece with Edward Forrest), *Oraloosa*, and *The Broker of Bogota;* he was also the author of well-known novels—*Calavar* (1834), *The Infidel* (1835), *Nick of the Woods* (1837), etc. He was editor and part owner of the Philadelphia *North American Gazette*.

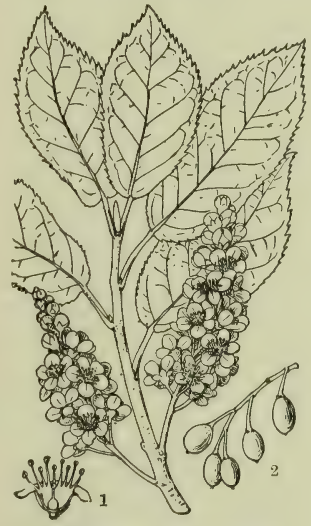
Bird, WILLIAM. See BYRD.

Bird - catching Spider, the name given to the species of the genus Mygale, which are very large, hairy spiders found in tropical countries, especially in the Amazon Valley. They appear to live chiefly on insects, but the fact that they can kill small birds would appear to be well authenticated. The body may reach a length of 2 in., and the span is stated to be sometimes as much as 7 in.

Bird Cherry (*Prunus padus*) is a species of the order Rosaceæ, and in the same genus as cherry and plum. It belongs to temperate Europe and Asia, and is known also as the hagberry—*i.e.* 'berry of the woods.' It differs from the wild cherry in being in full leaf before it flowers usually in May. The flowers are much smaller than those of the wild cherry, and are set in racemes from 3 to 5 in. long; these are upright at first, but as the flowers expand the raceme becomes pendulous. The cherries are black, about the size of peas, somewhat astringent and bitter.



Bird-catching Spider.



Bird Cherry (*Prunus padus*).
1, Flower (section); 2, fruit.

Bird-lice, or MALLOPHAGA, a family of Neuropterous insects which are not blood-suckers like true lice, but have mouths adapted for biting, and feed upon the feathers of birds or the hair of mammals; hence called biting lice. An active form (*Menopon pallidum*) commonly infests domestic poultry, though other species also occur on these birds. Mallophaga occur on mammals as well as on birds, but it does not appear that they multiply with the same rapidity as true lice, or that under natural conditions they are often numerous enough to cause serious trouble.

Birdlime, a viscid material obtained from the bark of holly and similar trees by boiling. It is used by European and Japanese bird-snarers for smearing twigs, but is rarely, if ever, made or used in the United States.

Bird of Paradise, a general name given to the members of the family Paradiseidæ, which includes beautiful birds inhabiting the Malay Archipelago, and extending into the Australian region. Although the birds of paradise are allied to the plainly dressed crows, they excel all other birds in their magnificent development of accessory plumes and their glory of color. As usual among birds, these statements are true only of the males, the females being relatively plain. The diet consists largely of seeds and fruits, but these are mingled with insects, and also, to a less extent, with worms, snails, frogs, and lizards. Among the most striking forms are the great bird of paradise (*Paradisea apoda*), the one commonest in collections; *Cicinnurus regius*, or the king paradise bird, which is glossy scarlet with a bright green throat patch; the glossy black rifleman (*Ptilorhis paradisea*); and the 'magnificent' bird of paradise (*Diphyllodes magnifica*), with its wonderful erectile ruff. For descriptions of the birds in their native haunts, reference should be made to A. R. Wallace's *Malay Archipelago* (10th ed. 1890). See also article BOWER-BIRD.

Birds constitute one of the best-defined groups in the animal kingdom, being distinguished at once from all other animals by the characteristic covering of feathers. The presence, in addition to feathers, of an epidermic covering of scales over parts of the body is an external character which suggests a descent from reptiles—a suggestion borne out alike by details of internal structure and by geological evidence. Indeed, in spite of the fact that some birds do not fly, we may say, speaking broadly, that birds are distinguished from reptiles by those peculiarities of structure and function which bear, directly or indirectly, upon the power of flight. It may, therefore, be convenient to discuss the characteristics of birds in connection with the power of flight rather than in strict systematic order.

The organs of flight in a bird

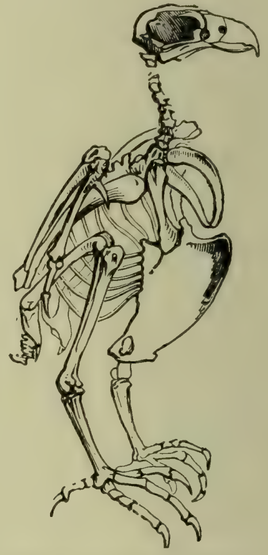
are the fore limbs, which have been converted into wings. The result of this is that the posterior limbs only can be used in supporting the body on the ground: the bird—to use an old term—is a biped. Now, these changes of function of fore limb to wing, and hind limb to sole support, have produced striking and, in a sense, independent modifications of structure.

Wading and Swimming Birds.

1. Stormy petrel. 2. Mandarin duck (male). 3. Scarlet ibis (Tropics). 4. Great northern diver. 5. Flamingo. 6. Red-breasted goose (Asiatic). 7. King penguin (Antarctic).

Considering first the fore limb, we find that the conversion into a wing has resulted in the reduction of the hand to three fingers, of which one only (the index) is well developed. It is this first or index finger which bears the large *primary* feathers of flight, and it is always of considerable length. The length is partly given by the long palm-bone (metacarpal), which is fused to the palm-bone of the rudimentary middle finger. The first digit, or thumb, is represented by a small rod of bone, which bears a small independent tuft of feathers, known as the false wing (*ala spuria*). In the majority, though not in all existing birds, claws are absent from all the fingers. There are only two separate wrist-bones, and the wrist-joint possesses very little freedom of movement. Without entering into structural details, one would notice the peculiar folding up of the arm when at rest, and the strong ulna, or outer bone of the fore arm, which carries the *secondary* feathers of flight. Especially important in connection with flight are also the united clavicles, which together form the merrythought or wishbone; the strong coracoids, bones represented in ourselves only by a process on the shoulder-blade; the great keel on the breastbone to which the muscles of flight are attached; the fusion of the vertebræ in the back to form a firm fulcrum on which the wings may play, and so on.

In connection with the modified hind limbs, one would notice especially the great elongation of the pelvis, which extends both in front and behind the cup in which the top of the thigh is placed, so that the weight of the body lies partly in front of and partly behind the point of support. A comparison of a living bird with a skeleton of one of the same kind will show how beautifully the body is balanced about the legs; but to this statement swimming birds form an exception, for in them the legs are placed far back, and the gait is in consequence clumsy and awkward. Again, in the limb itself the ankle-bones seem to be absent, and the bones of the sole of the foot (metatarsals) are fused together and with the missing tarsals to form a single bone. The little toe is always absent, a bird never having more than four toes.



Skeleton of a Bird (Falcon).

In living birds the tail is always short, and usually ends in a bony plate, the ploughshare bone, which carries a bunch of tail feathers, of much importance in flight.

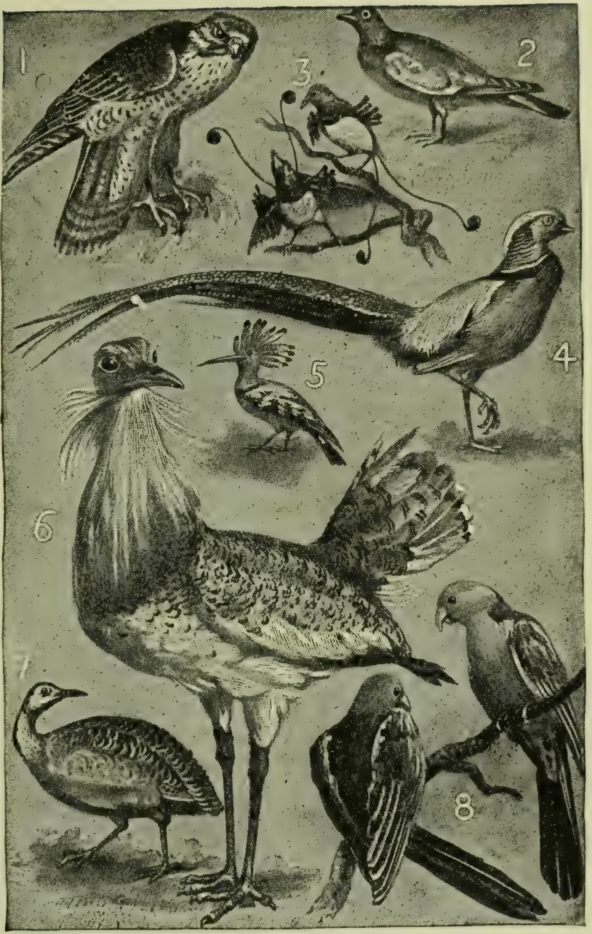
The feathers give the necessary resistance to wings and tail during flight, and keep the body warm.

Its temperature is unusually high, this being, again, no doubt associated with the quickened respiration necessitated by flight. This respiratory efficiency depends on the development of air-sacs connected with the lungs, and with it is associated a four-chambered heart, and a circulation as perfect as that of a mammal. As in swift-moving animals in general, the head is relatively small, though the brain is better developed than that of a reptile. In living birds teeth are absent, and the jaws are covered with a horny beak. Birds lay eggs as do reptiles, but they are fewer in number. Their high intelligence enables the parents to protect their eggs and young by many ingenious devices, and the young are also, in almost all cases, devotedly cherished until the dangers of early life are past. The vast migrations performed by many birds are ascribed ultimately to the desire to seek safe nesting-places in which the young may be reared. Finally, in accordance with their high specialization, we find that birds not only rank among the most beautiful and highly ornamented of animals, but also frequently possess the power of song.

The classification of birds is a matter of great difficulty, for many characteristics hitherto relied upon prove, on inquiry, to be merely adaptations to a similar method of life.

Most authorities agree that birds should first of all be divided into two great sets—the Archæornithes ('primitive birds'), including only the strange fossil known as Archæopteryx; and the Neornithes ('modern birds'), including all other known birds, fossil or living, in all of which the tail is short and the palm-bones fused. The arrangement of birds at the right is that adopted by Knowlton and Ridgeway. Consult the volume on *Birds* in the 'Cambridge Natural History,' by A. H. Evans; Beddard's *The Structure and Classification of Birds;* Pycraft's *History of Birds;* Wilson's *American Ornithology;* Coues' *Key to North American Birds;* Chapman's *Handbook of Birds of Eastern North America* (1916); Bailey's *Handbook of Birds of Pacific Coast* (1917)- Allen's *Birds and Their Attributes* (1925); Henderson's *The Practical Value of Birds* (1927); Saunders' and Clarke's *Manual of British Birds* (1927).

Birdsboro, borough, Pennsylvania, in Berks County, on the Schuylkill River and on the Pennsylvania and Reading Company Railroads, 9 miles southeast of Reading. It has blast furnaces, rolling mills, foundries and machine works. Pop. (1910), 2,930 (1920) 3,299.



Typical Land Birds

1. Falcon. 2. Dove. 3. King bird of paradise. 4. Golden pheasant. 5. Hoopoe (Europe). 6. Great bustard (Asia). 7. Rufous tinamou (S. America). 8. Parrot (*Aprosmictus*, E. Australia).

ORDER	TYPE
1–Hesperornithiformes	Hesperornis
2–Ichthyornithiformes	Ichthyornis
3–Struthiornithiformes	True Ostriches
4–Rheiformes	South American Rheas
5–Casuariiformes	Carrowaries and Emus
6–Crypturiformes	Tinamous (South America)
7–Dinorithiformes	Moas (extinct)
8–Æpyornithiformes	Giant birds (extinct)
9–Apterygiformes	Kiwi (New Zealand)
10–Sphenisciformes	Penguins
11–Colymbiformes	Loons and Grebes
12–Procellariiformes	Petrels, Albatrosses
13–Ceconiiformes	Cormorants, Pelicans, Herons, Storks, Flamingos
14–Anseriformes	Swans, Ducks, Geese
15–Falconiformes	Vultures, Hawks, Eagles
16–Galliformes	Fowls, Hoatzin
17–Gruiformes	Cranes, Rails, Bustards
18–Charadriiformes	Plovers, Shore Birds, Pigeons, Sand Grouse
19–Cuculiformes	Cuckoos, Parrots
20–Coraciiformes	Rollers, Owls, Swifts, Woodpeckers, Humming-birds
21–Passeriformes	Larks, Thrushes, Swallows, Wrens, Crows, Finches, Warblers

Bird's Eyes, in timber, nodules in planed wood formerly said to be caused by lateral latent shoots which terminate in dormant buds, but now thought to be caused by the blow of a woodpecker hard enough to bruise and arrest the activity of the cambium for a short time without loosening the bark.

Bird's-foot (*Ornithopus*), a genus of plants belonging to the order Leguminosæ. The common bird's-foot grows on dry sandy or gravelly soils, and is a small plant of little importance, although eagerly eaten by sheep. *O. sativus* is the Serradilla, a forage crop of Europe.

Bird's-foot Trefoil (*Lotus corniculatus*), a genus of plants and shrubs belonging to the order Leguminosæ. There are some eighty species widely distributed and grown for their yellow, purple and rose colored flowers. The plant is sown in permanent pasture for forage.

Bird's-foot Trefoil (*Lotus corniculatus*)

Bird's Nests, Edible. See Edible Bird's Nests.

Birds of Prey, a group of birds classed according to their predatory habits rather than according to similarity of structure. Older classifications divided them into nocturnal and diurnal birds, the former including the owls and the latter the falcons, hawks, eagles, kites, vultures and the like, but the more modern classification divides them into three orders, the owls (*Striges*), the ospreys (*Pandiones*), and the Accipitrines, which include the *Falconidae*, the *Vulturidae*, the *Carthartidae* and the *Serpentariidae*.

The members of this group are generally characterized by strong curved beaks and talons, keen eyesight, and swift and powerful flight. Some members live by killing their own prey, while others subsist on carrion. They are far more numerous in warm climates than in cold and usually live permanently in the district of their choice. Many of them mate but once and the number of young produced is seldom more than four. The plumage is usually a plain color, black, white, red or brown, and the female is generally larger than the male. See also such articles as Buzzard; Eagle; Falcon; Hawk; Owl, Vulture.

Birejik. See Bir.

Biretta, or Baretta, a term originally used for a pontifical cap, but now for the square cap worn by Roman Catholic and certain Anglican clerics.

Birge, Edward Asahel (1851–), American naturalist was born in Troy, N. Y. He was graduated from Williams College in 1873; and has been connected with the University of Wisconsin since 1875, as instructor in natural history (1875), professor of zoölogy (1879–1911), dean of college of letters and science (1891–1918), acting president (1900–03), president (1918–25) and president emeritus. He became secretary of the Wisconsin State fisheries commission in 1895, director of State geological survey in 1897, and president of the American Microscopic Society in 1903. He is the author of numerous articles and papers on zoölogy.

Birkbeck, George (1776–1841), English reformer, the founder of mechanics' institutions, was a native of Settle, in Yorkshire. In 1800, while a professor of natural philosophy at Anderson's College, Glasgow, he established courses of lectures in science for workingmen which evolved into the Glasgow Mechanics Institution, believed to be the first of its kind to be established. In 1804 he removed to London and in 1824 he organized the London Mechanics Institution.

Birkbeck Institute, an institution founded by George Birkbeck (q.v.) as the London Mechanics Institute (1824), with the aid of Brougham, Bentham, Cobbett, and others. It is now known as Birkbeck College, and is held in Bream's Buildings, Chancery Lane. It was incorporated in 1891 as part of the City Polytechnic.

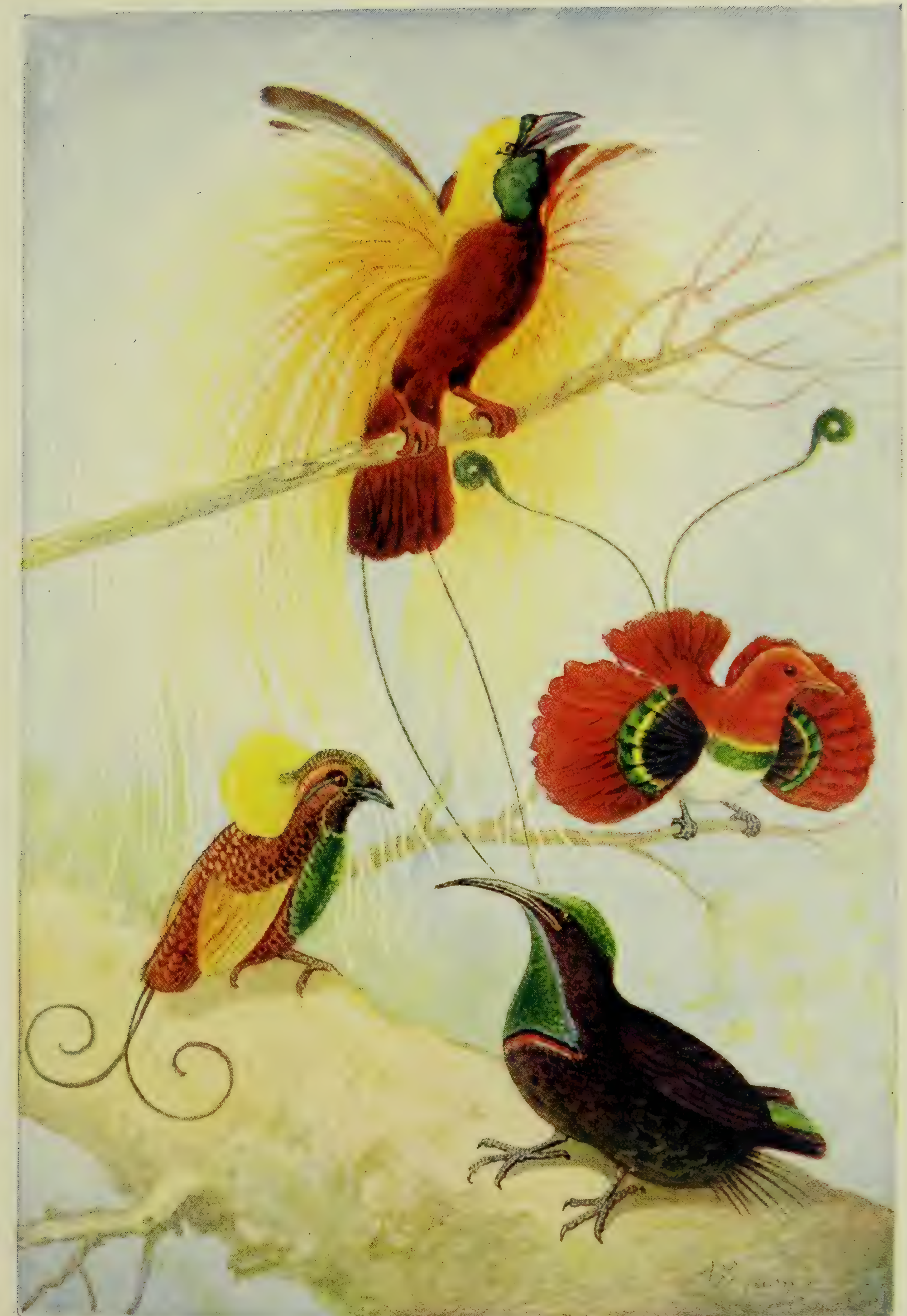
Birkdale, parish, England, in Lancashire, on the coast, 1½ miles southwest of Southport, of which it forms a populous suburb. It has well equipped hydropathic institution.

Birkenfeld, bēr'ken-felt, province of Germany, dependent upon the republic of Oldenburg, but entirely surrounded by the Prussian province of Rhineland. Its surface is hilly and well wooded, and is drained by the Nahe. Agriculture and horticulture are carried on, and the polishing of gems (agates) is a leading industry. Pop. (1919) 51,260.

Birkenhead, bûrk'n-hed, seaport and market town, England, in Cheshire, on the left bank of the Mersey, opposite Liverpool; 15 miles northwest of Chester. It has terminal stations on the London and North Western, the Great Western, and the Birkenhead and Hoylake Railroads. Features of interest are St. Aidan's theological college, Birkenhead Park (laid out by Sir Joseph Paxton), in Claughton, and opened in 1847, one of the finest of its kind in the country, Mersey Park and Bidston Hill (observatory). Though dating from the 12th century, it became important only after the opening of the dock at Wallasey Pool in 1847. The docks now have an area of 506 acres. Woodside Lairage is one of the largest and best equipped abattoirs in the kingdom. The tunnel under the Mersey, between Birkenhead and Liverpool, was opened in 1886. Shipbuilding forms the chief industry, the Laird shipyard (established in 1824), being of world-wide renown. Coal is largely exported and there are engineering works, breweries, and iron-smelting works. The town was incorporated in 1877 with Claughton, Oxton, Tranmere, and part of Higher Bebington. In 1831 it was a village of little over 200 inhabitants, but the present population (1921) is 145,592.

Birkenhead, Frederick Edwin Smith, 1st Lord (1872–), Lord Chancellor of Great Britain since 1919, was born in Birkenhead. He was educated at Oxford and was called to the bar at Gray's Inn in 1908. He was elected for Walton division, Liverpool (1906), which he continued to represent until 1919. He was prominent in the Ulster movement against Irish Home Rule (1914); was knighted on becoming solicitor general in 1915, and became baronet in 1918. During the Great War he was administrator of the Press Censorship, and later saw service in France with the Indian Corps. He is an authority on international law and the author of several books on that subject, *My American Visit* (1918), *The Indian Corps in France* (1918).

Birmingham, municipal borough and city (lord mayor



BIRDS OF PARADISE.

since 1893), and county borough Warwickshire, England; 112 miles by rail northwest of London. It is situated at the confluence of the rivers Rea and Tame and is the junction of the London and North Western, the Great Western, the Midland, the Birmingham, Wolverhampton, and Dudley lines. The municipal borough (1832) includes the parishes of Birmingham and Edgbaston, and part of Aston; the parliamentary borough (extended 1885) includes the local government districts of Balsall Heath, Harborne, Saltley, and the hamlet of Little Bromwich, and is divided into seven single-member constituencies.

Birmingham is the commercial capital of the Midlands, and the second manufacturing city of England. Though mentioned in Domesday, and sacked by Prince Rupert during the civil war (1643), the city is essentially modern, and has no antiquities worth mentioning, except Aston Hall and some monuments of the Berminghams (St. Martin's church), who held the manor from at least the reign of Edward I. Many of the streets, notably New Street, are wide and stately, and the public buildings are metropolitan in character. The Town Hall, of Corinthian design, with massive detached columns copied from those of the temple of Jupiter Stator at Rome, contains a fine organ, and is famed for the Birmingham musical festival (instituted 1768), which is held triennially. The council house, the corporation museum, art gallery, Victoria law courts, and many other public and educational buildings are also notable. Birmingham University, founded in 1900, possesses the usual faculties, but has a strong modern scientific and commercial tendency. It has its nucleus in Mason College, founded by Sir Josiah Mason in 1875 for scientific education. Other educational establishments are Queen's College (1828), King Edward's grammar school (founded 1552), the school of art (1885), the free grammar school (1833), the corporation technical school, and Birmingham or old library (1797). Birmingham is a bishopric of the Anglican and an archbishopric of the Roman Catholic Church. The Roman Catholic cathedral (1839–41) was designed by A. W. Pugin. Among many statues is one to the chemist Dr. Priestley, whose house was sacked and burned and whose library and MSS. were destroyed by a 'church-and-king' mob in 1791. Birmingham has ten public parks, the largest being Cannon Hill Park, covering 57 acres.

The proximity of Birmingham to the South Staffordshire coal field makes the city the hardware metropolis of the kingdom. Steam-engines and gas-engines, small-arms (Royal Birmingham Small-arm Factory), ammunition, bicyles, screws, and metal ornaments are a few of its many manufactures. It is the chief centre of the brass trade; cheap jewelry (thus 'Brummagem'), glass, steel pens, and chemicals are largely manufactured; and electro-plating and brewing are extensively carried on. Watt perfected the steam-engine here, and in conjunction with Boulton founded the Soho Works.

Birmingham was an old Anglo-Saxon town. During the Civil War it was strongly Puritan and was burned and sacked by Prince Rupert. About the middle of the eighteenth century it began to assume importance as a manufacturing centre. It took a leading part in the reform agitations of 1832 and 1835, and was the centre of the Chartist movement (see CHARTISM), resulting in the riot of 1839. The foundation of the bishopric of Birmingham was announced on Jan. 13, 1905, and St. Philip's was made the cathedral church. Pop. (1911) 525,960. Consult Dent's *Old and New Birmingham;* Hutton's *History of Birmingham;* Jones' *A Short History of Birmingham.*

Birmingham: Town Hall.

Birmingham, city, Alabama, county seat of Jefferson county, is situated near the centre of the State, on the Seaboard Air Line, the Central of Georgia, the Southern, the Louisville and Nashville, the Illinois Central, the Atlanta, Birmingham and Atlantic, the Alabama Great Southern, and the Mobile and Ohio Railroads; 95 miles northwest of Montgomery.

It is a well built, imposing city, with handsome residences, well-paved streets, fine public buildings, and good schools. Notable edifices are the City Hall, new Post Office, Auditorium, Union Station, Tutwiler, Molton, Hillman and Morris hotels, St. Vincent's Hospital, Hillman Hospital, and Jefferson Theatre. The city is the seat of Howard College (Baptist) and Birmingham-Southern College (Methodist). There are fifteen beautiful parks, the chief of which are Capitol, East Lake, Lakeview, and North Birmingham.

Birmingham is situated in the heart of a rich coal and iron district; three great coal fields, the Warrior, the Cahaba, and the Coosa, aggregating over 8,600 square miles, are all directly tributary to the city. There are immense iron and steel works, blast furnaces, rolling mills, machine shops, boiler works, brass works, and cement factories, and cotton, cottonseed oil, foundry facings, candy, cigars, boxes, chemical products, iron pipe, baskets, and stoves are manufactured. There is also a large trade in lumber and agricultural products. According to the Federal Census of Manufactures for 1914, industrial establishments numbered 352, with 10,863 wage earners, $55,844,000 capital and products valued at $43,144,000.

Birmingham is governed by a board of five city commissioners, elected for a term of four years, and representative of the municipality at large.

Birmingham was settled in 1871 and named after the English Birmingham. Since 1900 its growth has been uniformly rapid. In 1910 Wylam, East Lake, Eusley, Pratt City, Elyton, West Birmingham, North Birmingham, West End, Woodlawn, and Avondale were incorporated with Birmingham into Greater Birmingham. Pop. (1900) 38,415; (1910) 132,685; (1920) 178,270.

Birnam, bûr′nam, village, Perthshire, Scotland, on the right bank of the Tay, less than a mile south of Dunkeld. South of the village rises Birnam Hill (1,324 feet), once covered by a royal forest (see *Macbeth*). Remains of 'Duncan's Camp,' a vitrified fort, may be seen on the southeast slope.

Birney, bûr′ni, David Bell (1825–64), American soldier, son of James G. Birney (q. v.), was born in Huntsville, Ala. He practised law in Philadelphia (1848–61), and during the Civil War served, with much ability, on the Federal side, rising from the rank of lieutenant-colonel of volunteers (commissioned April, 1861) to that of major-general of volunteers (commissioned Sept., 1863). He took a conspicuous part in the battles of Fredericksburg, Chancellorsville, and Gettysburg (in which he commanded a division, and, for part of the time, the Third Army Corps), and, under Hancock, in the Wilderness. He died of a fever contracted in the Virginia campaign of 1864.

Birney, James Gillespie (1792–1857), leader of the conservative or constitutional Abolitionists in the United States, was born in Danville, Ky., a member of a wealthy slave-holding family. He was graduated from Princeton in 1810, studied law, practised at Danville, and in 1816–18 was a member of the lower house of the Kentucky legislature. From 1818 to 1833 he lived near Huntsville, Ala., and served in the first General Assembly of the State (1819), in which he introduced a law, which was passed, allowing slaves on trial before a jury to have counsel. By opposing a resolution endorsing Andrew Jackson for the presidency, however, he cut short his political career. Though he was himself a slaveholder, he gradually became more and more impressed with the evils of slavery, and in 1832 became agent in the Southwest of the American Colonization Society, the futility of which, however, he soon perceived. About 1827 he became a gradual emancipationist; he returned to Danville, Ky., in 1833 to urge the cause; in 1834 he freed his own slaves, and in the same year abandoned the Colonization Society, became a convert to immediatism, and identified himself with the American Anti-Slavery Society, of which he was made a vice-president. He then (1835) attempted to establish an anti-slavery journal in Danville, but for this he was ostracized socially, and not being able to secure a printer, he removed to Cincinnati, O., and there on Jan. 1, 1836, issued the first number of *The Philanthropist.* Even here he met with fierce opposition, but his paper exerted considerable influence in the Middle West. He soon turned over the active control to Gamaliel Bailey, and, removing to New York City (1837), devoted himself to the cause, chiefly as a lecturer, and as secretary, of the Anti-Slavery Society. He was opposed to the extremists, headed by Garrison, would not join them in their advocacy of 'no government' views, and was, therefore, one of the leaders of those Abolitionists who broke away from the American Anti-Slavery Society (1840), and founded the Liberty Party, of which he was twice (1840 and 1844) the candidate for the presidency. (See Abolitionists and Liberty Party.) In 1845 a fall from his horse disabled him for life, and until his death he lived in retirement.

Birney is one of the most attractive personalities in the great anti-slavery struggle in the United States; in no sense an extremist, he deprecated the radicalism of Garrison and his followers, which, he thought, would inevitably alienate many friends of emancipation and injure the cause. He was himself tolerant and fair, but courageous and unflinching in his advocacy of what he believed to be the right. Among his publications are *On the Sin of Holding Slaves* (1834); *Letter on Colonization* (1834); *Addresses and Speeches* (1835); *Political Obligations of Abolitionists* (1839), *American Churches the Bulwarks of American Slavery* (1840), and *Speeches in England* (1840). Consult William Birney's *Life and Times of James G. Birney.*

Birney, William (1819–1907), American soldier and lawyer, son of James G. Birney, (q. v.), was born near Huntsville Ala., and studied in Paris, where he participated in the revolution of 1848. He served with distinguished gallantry in the Union forces during the Civil War, was promoted to the rank of brevet brigadier-general, and took a prominent part in organizing the colored troops. After the war he practised law in Washington, D. C., from 1874 until his appointment as counsel for the District of Columbia in 1900. He wrote *The Life and Times of James G. Birney* (1890).

Biron, bē′rōn; *French* bē-rô**n**′, family of distinguished French generals. Armand de Gontaut, Baron de Biron (1524–92), fought against the Huguenots. His son, Charles (1561–1602), became marshal (1594) of France and (1598) duke, and governor of Burgundy. He was beheaded in the Bastille for treasonable practices.—Armand Louis (1753–94), Duc de Lauzun, accompanied Lafayette to America (1778), commanded an unsuccessful expedition to rescue New York from the British in 1781, and, returning in 1783, became general-in-chief of the army of the Rhine in 1792. He was executed during the Reign of Terror, having incurred the displeasure of Fouquier-Tinville.

Biron, Ernst Johann (1690–1772), Duke of Courland, whose real name was Bühren, was the favorite of the Empress Anna Ivanovna, niece of Peter the Great, and became practically ruler of all the Russias. A blood-thirsty tyrant, he was responsible for the execution or banishment of thousands who stood in his way. Biron assumed the regency when the empress died (1740); but a conspiracy was formed against him by Münnich, with the result that he and his family were exiled to Siberia. He was recalled (1741) shortly afterward by the Empress Elizabeth, but took no further part in state affairs.

Birr. See Parsonstown.

Birrell, bûr′el, Augustine (1850-), English barrister and author, was born near Liverpool, was graduated from Cambridge University (1872), and became a barrister (1875). He was Quain professor of law at University College, London (1896–9), member of Parliament for West Fifeshire (1889–1900), president of the National Liberal Federation (1904–05), president of the Board of Education (1905–07), chief secretary to the Lord Lieutenant of Ireland (1907–16), and member of Parliament for North Bristol (1906–18). His works include *Obiter Dicta* (two series, 1884, 1887); *Life of Charlotte Bronte* (1885); *Res Judicatæ* (1892); *Men, Women, and Books* (1894); *Sir Frank Lockwood* (1898); *Collected Essays* (1900); *Miscellanies* (1901); *In the Name of the Bodleian* (1905); *William Hazlitt* (1902) and *Andrew Marvell* (1905) in the 'English Men of Letters' series; *Frederick Locker-Lampson: A Character Sketch* (1920).

Birs, bērs, small river in Northwestern Switzerland, joining the Rhine east of Basel. In 1444, at the leper house of St. Jakob-bei-Birsfelden, a body of confederates, less than 1,500 strong, stood to the death against 30,000 Armagnac free-lances advancing on Basel.

Birth. For Registration of Birth, see Registration. For Statistics, see Vital Statistics.

Birth, Concealment of, is a criminal offence in the law of all civilized countries. In the United States all the parties, including the mother, concerned in the concealment, or in the secret disposal of the body, whether born alive or dead, are guilty of a misdemeanor, and are liable to imprisonment. In England every person who endeavors to conceal a birth by a secret disposition of the dead body of the child is liable to be imprisoned, with or without hard labor, for a term not exceeding two years. See INFANTICIDE.

Birthmark. See ANGIOMA.

Birthright, the right of succession to property based on the order of birth of the several claimants. Such a right has been recognized in most systems of law, but it belongs to an order of legal ideas now generally obsolete. In its primitive form birthright did not necessarily involve the total exclusion of other heirs than the privileged one, but usually involved an unequal distribution of the estate, the birthright being a right to receive the largest share of the inheritance. See PRIMOGENITURE; HEIR.

Biru. See WALATA.

Bisacquino, bē-säk-kwē′nō, town, province Palermo, Sicily; 11 miles south of Corleone. Pop. 10,500.

Bisalnagar, bis′ăl-nŭg-ȧr, or VISNAGAR, town, Kadi district, Baroda, Bombay Presidency; 50 miles north of Ahmedabad. It has cotton manufactures. Pop. 20,000.

Bisanthe. See RODOSTO.

Bisayas. See VISAYAS.

Bis′bee, town, Cochise county, Arizona, on the El Paso and Southwestern Railroad; 80 miles southeast of Tucson, and 8 miles from the Mexican boundary. It is the centre of an important lead, silver, gold, and copper mining region, and has large smelters, with a daily output of 7,000 tons. Pop. (1910) 9,019.

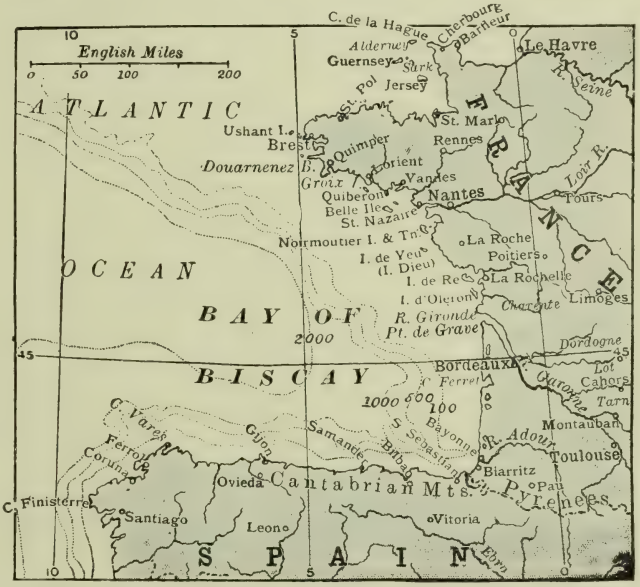
Biscay. See VIZCAYA.

Bis′cay, Bay of (ancient *Cantabricum Mare* and *Aquitanus Sinus;* French, *Golfe de Gascogne*), that portion of the Atlantic Ocean which sweeps in along the northern shores of the Spanish Peninsula, and thence curves northward along the western shores of France. Except between the estuary of the Gironde and the mouth of the Adour, where it is lined by low sand dunes and lagoons, its shores are bold and rocky. Besides the two rivers just named, it receives the Vilaine, Sèvre, Charente, and Dordogne. From the extreme points (Bretagne to Galicia) it measures some 340 miles. Along its northeast shore are the small islands of Belleisle, Noirmoutier, Ré, and Oléron. Its depth along this part of the coast of France is in places as little as 20 fathoms, but increases off the north coast of Spain to 200 fathoms. Under the impact of northwest winds it becomes extremely boisterous.

Bisceglie, bē-shāl′yā, seaport and episcopal see, Bari province, Italy; 21 miles northwest of Bari. It has a twelfth-century cathedral, and ruins of an old Norman castle. Pop. (1911) 34,425.

Bischofswerda, town, Saxony; 20 miles northeast of Dresden. Pop. (1910) 8,048.

Bischweiler, town, Alsace-Lorraine, Germany; 15 miles northwest of Strassburg. It manufactures jute and grows hops. Pop. (1910) 8,145.



Bay of Biscay.

Biscuit, in the United States, is the name given to small, round, soft cakes made from dough, raised with yeast or soda, and sometimes shortened with lard. What are known as biscuits in England are usually called crackers in the United States.

Biscuit, in pottery, is the name given to porcelain and other pottery after the first firing. See POTTERY.

Bisharin, bē-shä-rēn′, or BEJA, a people inhabiting the lower part of the Blue Nile, between about 24° N. lat. and the frontier of Abyssinia. They are probably the descendants of the ancient Blemmyes (q. v.).

Bishnapur, bish′nȧ-pōōr, the ancient capital of Bankura district, Bengal, India; 80 miles northwest of Calcutta. It is a municipal town, with manufactures of fine cotton and silk cloth. Pop. 20,000.

Bish′op, the highest order of the clergy in Christian churches. The word comes from the Anglo-Saxon *biscop*, an abbreviated form of the Greek *episcopos*, 'overseer.' In classical writers it signifies an inspector or superintendent of any kind; and in the Septuagint the usage of the word corresponds, on the whole, to that in classical writers. While the word itself has been retained, however, the sense attached to it has undergone a radical alteration. Throughout the New Testament *episcopus* is interchangeable with *presbyter;* both are synonymous titles of officers who direct the discipline and administer the affairs of a single congregation. But as the Church grew, and cities contained more than one congregation, the chief presbyter superintended the clergy of all the other churches from the mother church. Gradually the idea spread to the government of a diocese, and the leading presbyter was known particularly as the Episcopos, or Bishop.

While Roman Catholics admit that in the New Testament the same persons are sometimes indifferently called 'bishops' or 'presbyters,' they hold that it was because these individuals discharged both functions. But it is their belief that Christ designed both orders, making the bishops the direct successors of the apostles, and placing the ordination of priests in their hands alone. (See Succession, Apostolic.) The High Church Anglicans consider episcopacy as necessary not only to the well-being, but to the being of a church. To Anglicans of the more moderate school, episcopacy is a venerable form of church government which descends from apostolic times, but they do not pronounce it to be so essential a matter that they should unchurch the Protestant communities which have been formed on another model. Presbyterians, on the other hand, contend that the government of the church by presbyters has, and has alone, the sanction of the New Testament, and they reject modern episcopacy as a corruption of primitive Christianity. The early Lutherans denied its divine institution, but were quite willing to tolerate it.

The bishop of the *Roman Catholic Church* belongs to the highest order of the hierarchy. He must be a man of thirty years of age, and of approved learning and virtue. He is selected by the pope out of a number of eligible priests whose names are submitted by the chapter of priests connected with the cathedral church. Before his appointment he must pass a double examination, and when selected he cannot perform the duties of his office until consecrated, which takes place before three bishops at least, within three months after his election. His duties are to exercise full spiritual control in his cathedral church and preside over the entire diocese. He ordains priests, assigns their fields of labor, dedicates and consecrates new churches, and is the court of appeal for the lower orders of the clergy. He is subject by divine law to the councils of the church and to the pope, and by ecclesiastical law he is in subordination to patriarchs, metropolitans, etc. In respect of orders—*i.e.*, the power of consecration and the like—he has no superior. His insignia are the ring, pectoral cross, episcopal throne, mitre, pontifical vestments, gloves, and sandals.

The theory of the *Church of England* is much the same as that of the Roman Catholic Church, except that in England the authority of the crown has replaced that of the pope. The Anglican bishop is said to descend in direct line of consecration from his predecessors in the Middle Ages. He alone can ordain, confirm, and consecrate churches. He institutes to benefices and licenses curates; he has the right to preach throughout the diocese, to inspect the churches. He can withdraw the licenses of curates, who may, however, appeal to the metropolitan.

Bishops in the *Protestant Episcopal Church* perform the same duties as the Anglican bishops. They ordain priests and deacons, dedicate new churches, and exercise a general oversight in their diocese. They are chosen in a general convention of clerical and lay deputies of the diocese over which they are to preside, except in the case of missionary bishops, who are nominated by the house of bishops, and elected by the house of clerical and lay delegates.

In the *Methodist Episcopal Church*, which is somewhat presbyterial in its government, the bishops are elected in the General Conference composed of clerical and lay delegates. The bishops have no dioceses, but exercise joint jurisdiction over the entire church. Their place of residence is fixed by the quadrennial sessions of the General Conference. They itinerate as do the pastors; some being appointed to reside for a time in foreign lands as missionary bishops. Their duties are administrative, and their episcopal power has been curtailed in recent years. They preside over the annual conference of the church.

Bishops are found in all denominations in the United States holding the episcopal form of government, though the power of the bishop varies greatly in different churches. Due perhaps to the influence of a democracy, there has been a tendency toward a democracy as against a hierarchy in most episcopal churches, except the Roman Catholic, and even in that church the pope does not exercise his immediate authority in appointing bishops as in Spain and Austria.

See Episcopacy; Orders, Holy; Archbishop; Church, Anglican; Protestant Episcopal Church; Roman Catholic Church.

Consult Hatch's *Organization of the Early Christian Churches;* Lindsay's *Christian Ministry in the First Three Centuries* (1905).

Bishop, a beverage composed of red wine (claret, Burgundy, etc.) poured warm or cold upon ripe bitter oranges, sugared and spiced to taste, and drunk either hot or cold.

Bishop, Sir Henry Rowley (1786–1855), English composer, was born in London. From 1810 to 1824 he was director of music at Covent Garden, from 1825 to 1830 at Drury Lane, and from 1830 to 1833 at Vauxhall Gardens. Later he was professor of music at Edinburgh (1841–3) and Oxford (1848–55). Among his eighty-eight operatic entertainments were *Guy Mannering, The Miller and His Men, Maid Marian, Native Land,* and *The Virgin of the Sun.* He is best known for his settings of songs, including *Should He Upbraid, The Bloom Is On the Rye,* and *Home, Sweet Home.*

Bishop, Isabella (*née* Bird) (1832–1904), English traveller and author. Canada, Prince Edward Island, and the United States were the scenes of her first journey. She next visited the Sandwich Islands, the Rocky Mountains, and Japan. Her later travels were in Malaysia, China, Siberia, and Korea. She always took a warm interest in medical missions, and built five hospitals and an orphanage in the East. Her works include: *The Englishwoman in America* (1855); *Six Months in the Sandwich Islands* (1878); *A Lady's Life in the Rocky Mountains* (1874); *Unbeaten Tracks in Japan* (1880); *In the Golden Chersonese* (1883); *Korea and Her Neighbors* (1898); *The Yangtse Valley* (1899); *Pictures from China* (1900). Consult Stoddart's *Life* (1906).

Bishop Auckland, market town, Durham, England, at the junction of the Gaunless and the Wear; 9 miles southwest of Durham. Auckland Palace or Castle, the residence of the bishop of Durham, was founded about 1300. There are large coal mines in the vicinity, and engineering works in the town. Pop. (1901) 11,966; (1911) 13,839.

Bishop's College, University of, is situated in Lenoxville, Quebec, Canada, and is maintained by the Anglican Church. It was founded in 1843, and received a royal charter in 1853. The University grants degrees in arts (three years' course) and divinity (two years' course). In 1914 there were 60 students, with 9 instructors. The library contained 11,000 volumes.

Bishop's Ring, the corona or halo extending from 20° to 30° from the sun, first observed by Dr. Sereno Bishop at Honolulu on Sept. 5, 1883, after the great Krakatoa eruption. It was a diffraction corona produced by exceedingly small dust particles ejected from the volcano. The Bishop's Ring reached its maximum brilliancy in the spring of 1884, and gradually declined until June, 1886, when it disappeared. The ring and twilight glows were seen again in 1902–3 after the eruption of Mount Pelée in Martinique.

Bishop-Stortford, town, Hertfordshire, England, on the River Stort; 12 miles northeast of Hertford. It has malt houses, breweries, brickfields, and limekilns. Pop. (1911) 8,723.

Bishopweed, or Goutweed, also Goatweed, or Herb Gerard (*Ægopodium podograria*), an umbelliferous weed common in hedges and grass plots, and exceedingly difficult of extirpation on account of its creeping rhizomes. The leaflets are broad, triangular, and in groups of three; the flowers are small and whitish, in dense compound umbels. The plant is eaten by cattle, and the leaf stalks were formerly boiled and eaten as greens.

Bis'kra, or BIS'KARA (the Roman *Ad Piscinum*), town, Algeria, in an oasis watered by the Wady Biskra and by numerous artesian wells; 130 miles southwest of Constantine. A delightful winter climate makes it a popular resort, and it has several fine hotels. A French garrison is stationed here. Scenes of the neighborhood have been depicted in Hichens' *Garden of Allah.* There are sulphur springs in the vicinity. Pop. 10,000.

Bis'ley, village, England, in Surrey; 4 miles northwest of Woking. To Bisley Common were removed in 1890 the annual meetings of the National Rifle Association, formerly held at Wimbledon.

Bismarck, biz'mark, city, North Dakota, capital of the State, on the Missouri River, and the Northern Pacific and the Minneapolis, St. Paul, and Sault Ste. Marie Railroads; 440 miles west of Minneapolis, Minn. The Missouri is here crossed by a steel railroad bridge 50 feet above high water and by a $1,250,000 highway bridge, on the National Parks Highway. The city contains the State Capitol ($500,000) and other public buildings, and just east of its boundaries is the State Penitentiary. Industries include grain elevators, flour mill, creamery, and produce houses. The city is the wholesale and jobbing centre for Southwestern North Dakota, doing a wholesale and jobbing business of over $11,000,000 annually. In 1909 the commission form of government was adopted. Pop. (1910) 5,443; (1920) 7,122.

Bismarck Archipelago, a general name for the Pacific islands lying immediately east of New Guinea, between 141° 30′ and 156° E. long., and between the equator and 8° S. lat. It includes the following islands and groups of islands: New Britain, New Ireland, Lavongai, Duke of York Islands, Admiralty Islands, Mussau Islands, Gardner Islands, Nuguria, Nissan, Vitu Islands, Umboi Islands, Hermit Islands, Ninigo Group, Kaniet and Sae Islands; area about 20,000 square miles. The inhabitants are indigenous tribes of Melanesian descent, in a low stage of civilization.

Physically, as well as in their plant and animal life, these islands have a close affinity with New Guinea, but except for the coasts they are relatively little known. They are mostly mountainous; partly of coralline formation, and partly volcanic. They have a hot, moist climate, with the northwest monsoon (December to April). In addition to the usual native fruits and vegetables, the archipelago produces copra, cotton, rubber, and mother-of-pearl. In November 1884, a German Protectorate was declared over the New Britain archipelago and the following year it was renamed the Bismarck Archipelago. In the Great War it was occupied by an Australian force and at the conclusion of the war it was assigned to Australia under a mandate. The seat of government is in Rabaul, New Britain. Pop. (1922) about 176,000.

Bismarckburg, bis'märk-bo͝or*ch*, district, now known as Kasanga, in former German East Africa (q.v.), touches the east shore of the south end of Lake Tanganyika and includes Lake Rikwa. Kasanga, the capital, is situated at the south end of Lake Tanganyika.

Bismarck-Schönhausen, shûn'hou-zen, HERBERT NIKOLAUS, PRINCE (1849–1904), eldest son of Prince Otto von Bismarck, was born in Berlin. He entered the foreign office in 1873 and thereafter was engaged in various diplomatic missions. He was appointed *attaché* at London in 1882 and at St. Petersburg in 1884. He was Secretary of State for Foreign Affairs from 1886 to 1890 and a member of the Reichstag after 1893.

Bismarck-Schönhausen, OTTO EDOUARD LEOPOLD, PRINCE VON (1815–98), commonly spoken of as PRINCE BISMARCK, was the son of a Pomeranian squire. Born on his father's estate of Schönhausen—which name he assumed in after life in addition to Bismarck—he was sent in 1832 to the University of Göttingen, where he distinguished himself chiefly in physical exercises, and in fighting successfully twenty-seven duels. In 1846 he entered the Saxon provincial Diet, and in 1847 the general Diet of Prussia. He was appointed representative of Prussia at the Diet of Frankfort in 1851. In March, 1859, he was sent as ambassador to St. Petersburg, and in May, 1862, to Paris, whence he was recalled in September, 1862, to become Minister-President and Minister for Foreign Affairs.

Bismarck, whose anti-democratic spirit had declared itself from the first, now rode roughshod over the opposition of the deputies and the press, dominating his enemies with unconstitutional severity. After the war of spoliation against Denmark, Bismarck carried out his long-cherished policy for the humiliation of Austria. The sanguinary war of 1866, culminating at Sadowa, extinguished the leadership of Austria in Germany, and Prussia became the dominant power. The unification of Germany now set in. Frankfort received a Prussian garrison, Hanover was incorporated in the Germanic Confederation, and treaties were concluded with Bavaria, Baden, and Würtemburg. In 1867 Bismarck organized the North German Confederation, and for his services was made Chancellor of the Confederation and President of the Federal Council. The Luxemburg difficulty between France and Prussia was adjusted by the neutralization of that territory.

In July, 1870, France declared war against Prussia (see FRANCO-GERMAN WAR), and on the capitulation of Paris, Bismarck dictated the terms of peace. In January, 1871, the king of Prussia was crowned as German emperor at Versailles. Bismarck was appointed chancellor of the German empire, and raised to the rank of prince. He now occupied himself with domestic reform, and with the promotion of the drastic Falk laws against the Roman Catholics—a measure which resulted in the temporary expulsion of the Jesuits and the imprisonment of several bishops (see KULTURKAMPF). In December, 1872, he resigned the presidency of the state ministry, but continued to advise the emperor, and was reappointed Prussian Premier in 1873. The chief object of Bismarck's foreign policy was the preservation of the peace of Europe by the isolation of France, the conciliation of Russia, and the preservation of an alliance between Germany, Austria, and Italy. In 1878 he presided over the Berlin Congress (see BERLIN, CONGRESS OF).

After the accession of William II. in 1888, difficulties arose between the new sovereign and his minister. The former was exacting and imperious, while the latter sought to retain all his old power and influence. By the middle of March, 1890, matters had come to a crisis. Bismarck refused to comply with his sovereign's demand that he draw up an order reversing a decree of Frederick William IV., which made the Prussian minister-president responsible for the acts of the ministers, and his resignation followed. The Emperor did his best to make the Chancellor's retirement appear voluntary, raising him to the rank of Field Marshal and creating him Duke of Lauenburg, but the feeling of bitterness between the two could not be thus easily dispelled, and Bismarck soon drifted into open criticism of the government. His serious illness in 1893 brought about a pseudo-reconciliation which continued, on the surface at least, until his death, July 31, 1898.

In private life Bismarck was a man of warm affections. Though imperious in character, and sometimes unscrupulous and vindictive, he was cast in a large mould. He was tall and massive in person, fair and fresh of complexion, and quiet and cultured in manner. Though no orator, in public speeches he wielded the mother tongue with trenchant vigor. As the chief creator of modern Germany he will always hold a conspicuous place in history.

There are *Lives* in German by Busch, Görlach, Heyck, and Blum. Consult also Lowe's *Historical Biography;* Hahn's *Political Life, Labors, and Speeches;* Munroe-Smith's *Bismarck and German Unity; Love Letters of Prince Bismarck* (Eng. trans. 1901); *Correspondence of William I. and Bismarck* (Eng. trans. 1903).

Bismuth, biz'muth (Bi, 209.0), a metallic element that occurs in many places free, as well as in combination, as sulphide, oxide, and carbonate. Bismuth is extracted from the ore by melting out the free metal, the oxides and sulphides being decomposed by the addition of carbon and iron. It is a white, crystalline, brittle metal with a pinkish tinge, has a specific gravity of 9.8, is a poor conductor of electricity, and is very diamagnetic. It melts at 268° C., and solidifies with expansion. Heated in the air, it burns with a blue flame, forming yellow fumes of oxide; and unites with sulphur if heated with it. Its soluble salts are characterized by forming insoluble basic salts on addition of water—a property used in their detection.

Bismuth unites readily with other metals, forming fusible alloys, which are useful on account of their low melting points, and for expanding on solidification, thus enabling them to be employed, among other uses, in taking sharp casts of objects that would be damaged by a high temperature. Metallic bismuth is employed in making low-fusing alloys or cliché metals which are used in automatic fire sprinklers, fuses for electric wiring, and solder. (See FUSIBLE METAL.)

Bismuth forms several compounds of service in the arts and in medicine; it combines with oxygen to form several oxides, of which the trioxide, Bi_2O_3, is the most important. It is employed in porcelain manufacture as an agent for fixing the gilding, and for increasing the fusibility of fluxes, at the same time neutralizing the colors which are often communicated by them. The subnitrate or basic nitrate of bismuth receives the names of *pearl white, pearl powder, blanc de fard,* and *blanc d'Espagne.*

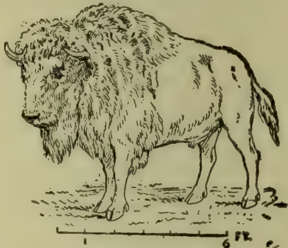
In medicine, bismuth is used chiefly as the subnitrate, acting on inflamed surfaces, as in eczema, and on mucous membranes, as a mild astringent and anodyne; its powdery form dries a 'weeping' surface. Bismuth is also employed in all forms of gastric and intestinal inflammation. A more recent application is in the treatment of syphilis. If combined with betanaphthol, it is antiseptic for the stomach and intestines.

Bismuth is found native in England, France, Peru, and Siberia, but is obtained chiefly from Saxony. A considerable quantity is produced in the United States as a by-product of the refining of metals. In 1924, the production from this latter source was estimated at 304,640 pounds. The imports of bismuth into the United States during 1925 amounted to 99,694 pounds valued at $187,340.

Bi'son, a genus of wild cattle closely allied to the ox, and represented by two rapidly disappearing species—the American *Bos americanus* or *Bison americanus,* and the European aurochs, or zubr, *Bos bison, Bos europæus,* or *Bison bonasus.* The bison is the largest quadruped now existing in Europe. It measures about 10 feet in length, stands about 6 feet high, and is extremely strong, especially in its fore-parts. Old bulls can readily cope with wolf or bear. The most striking differences between the bison and the ox are the hump just behind the neck, the broader convex forehead, the longer limbs, the shaggier head and shoulders. There are also internal differences, such as the presence of an additional rib. The females are not as large as the males, nor as shaggy on the fore-parts.

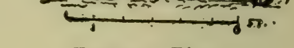
The food of the bison consists of grass and brushwood, and the leaves and bark of young trees. Its cry is peculiar, 'resembling a groan or a grunt, more than the lowing of an ox.' It does not attain its full stature until after its sixth year, and lives for about thirty or forty years. It has never been reduced to subjection by man, and the domestication even of individuals taken young has been only partial. The animal is generally shy and is easily provoked; it can be approached only from the leeward, its sense of smell being extremely acute. It runs swiftly, galloping with its head so low that the hoofs are raised above it.

The American bison, slightly smaller than the European bison, is interesting as the only living species of the ox family indigenous to America, except the musk ox of the subarctic regions. It is popularly called *Buffalo,* (q.v.), but must be distinguished from the true buffalo. The bison was formerly abundant in America, especially in the prairies beyond the Mississippi, and from 63° N. lat. to New Mexico. Even in the 19th century it was still found in Ohio. Now it is nearly extinct. In recent years, however, encouraging efforts at preservation have been made by the United States and Canadian governments and American bison societies, and the number of bison has been considerably increased. The principal centres devoted to the animals are the Yellowstone National Park, the Montana and Wichita ranges, and the Canadian government reserves in Alberta and Athabasca.



American Bison

The bison used to congregate in large herds, and when migrating travelled in solid columns of thousands and tens of thousands, which were scarcely able to turn or arrest their progress for the pressure of the masses from behind on those in front. The economic importance of the bison was considerable. The flesh, like coarse-grained beef, was tender and juicy, while the tongue, marrow bones, and hump were especially prized. The hump formed pemmican; the fat, tallow; the skins, clothing or tent and canoe covers; the hair, cloth; and the dried droppings, fuel.



European Bison

Consult Allen's *The American Bison;* Hornaday's *Our Vanishing Wild Life; American Big-Game*

Hunting, by T. Roosevelt and G. B. Grinnell (1893).

Bissagos Islands, a group of low, sandy islands off the w. coast of Africa, opposite the estuary of the Geba, between 11° and 12° N. lat. The largest islands of the group (Bolama, Orango, Gallinhas, etc.) belong to Portugal. Area, about 1,550 sq. m. Chief tn. Bolama.

Bisschop, Christoffel (1828), the painter of Friesland who, with Israels, has revolutionized Dutch painting. He paints sunlit interiors and enclosed spaces luminously warm—*e.g. The Morning Sun, Winter in Friesland, Sunshine in Heart and Home,* etc. See Muther's *History of Modern Painting* (1895–6).

Bissell, Edwin Cone (1832–94), American theologian, was born in Schoharie, N. Y., and graduated at Amherst. He studied divinity at Union Theological Seminary, New York, and was pastor of various Congregational churches, and American Board missionary to Austria until his acceptance (1881) of the professorship of Hebrew in Hartford Theological Seminary. Author of *Historic Origin of the Bible* (1873), *The Pentateuch, its Origin and Structure* (1885), and other works.

Bissell, George Edwin (1839), American sculptor, born at New Preston, Conn.; served in the Civil War, and subsequently was engaged in the marble business at Poughkeepsie, N. Y.; studied at Paris, Rome, and Florence (1875–6), and, until 1896, did much of his art work abroad, then setttling at Mt. Vernon, N. Y.; has executed Soldiers and Sailors' Monument (Waterbury, Conn.), the rilievo of Burns and Highland Mary (Ayr, Scotland), President Arthur (New York), *Hospitality* (Buffalo Exposition), and several statues and groups for the St. Louis Exposition.

Bissell, Wilson Shannon (1847–1904), American lawyer, was born at New London, Oneida co., N. Y., and graduated (1869) at Yale; studied law at Buffalo, and in 1872 formed a law partnership with Lyman K. Bass, to which Grover Cleveland was admitted the following year, the firm's name being changed to Bass, Cleveland & Bissell. Till 1893, Mr. Bissell had declined office, although serving as delegate at conventions; in that year he was appointed postmaster-general of the United States by Cleveland. He resigned in 1895 to resume the practice of the law.

Bissen, Hermann Wilhelm (1798–1868), Danish sculptor who studied at Rome (1823) under Thorwaldsen, by whose will he was appointed to complete his master's unfinished works and to take charge of his museum. Returning to Denmark, Bissen fostered there the classical traditions of Thorwaldsen, and he executed, among other works, a frieze for the palace hall at Copenhagen, an *Atalanta*, *Cupid sharpening his Arrows*, and *Valkyrie*. See *Life* by Plon (1871).

Bistritz (Hungarian, *Besztercze*), a royal free tn., Hungary, Transylvania, cap. of the co. of Bistritz-Naszód, 75 m. N.E. of Klausenburg. In the 15th and 16th centuries it was one of the principal commercial towns of Transylvania. Saw-milling and tanning are the principal industries. Pop. (1900) 10,873.

Bistritz-Naszód, a co. of Hungary, in the N.E. of Transylvania; is spread over the W. face of the Carpathians, and is consequently very mountainous. Timber, maize, fruit, and various minerals are the principal products. Area, 1,550 sq. m. Pop. (1900) 117,649, mostly Roumanians.

Bithur, tn., in N.W. Provinces (United Provs. of Agra and Oudh), India, 12 m. N.W. of Cawnpur, on l. bk. of the Ganges; is much frequented by pilgrims, and is devoted to the worship of Brahma. Here, on Aug. 16, 1857, Havelock, on his way to relieve Lucknow, defeated Nana Sahib, who had strongly fortified the town. Pop. (1901) 7,173.

Bithynia, dist., Asia Minor, bounded on the E. by Paphlagonia, S. by Phrygia, W. by Mysia, and N. by the Black Sea. Its inhabitants were immigrants from Thrace. In the 7th and 6th centuries B.C. it was part of the kingdom of Lydia, and then of the Persian empire, until, during its decline, the princes of Bithynia became independent, and, resisting Alexander and his successors, founded a kingdom which lasted until Nicomedes III., in 74 B.C., bequeathed it, on his death, to the Romans, of whose empire it became a province.

Bitlis, tn., Asiatic Turkey, 120 m. N.E. of Diarbekir; lies in a ravine, surrounded by hills above 2,000 ft. high. The people are largely engaged in the manufacture of firearms, and of cotton cloths noted for their bright-red dye. Tobacco of a very fine quality is exported. Here, in 1554, the Persians defeated Solyman the Magnificent. Pop. of vilayet, 398,600; of tn. 38,800.

Bitonto (anc. *Butuntum*), tn. and episc. see, prov. Bari, Italy, 9 m. W. of Bari, on the Apulian plain. The old town, surrounded by walls, and with narrow streets, has a Romanesque cathedral, a castle, and a theological seminary, and is encircled by modern quarters. It manufactures olive oil and good wine. Pop (1901) 30,652.

Bitsch, a fortified tn., Alsace-Lorraine, Germany, in Lorraine, 24 m. S.E. of Saargemünd. It is commanded by a citadel, partly hewn out of the solid rock, which was unsuccessfully besieged by the Prussians in 1815, and by the Germans in 1870–1. From 1766 to 1871 it was in the hands of the French. Pop. (1900) 3,640.

Bitter Almonds, Oil of, or Benzaldehyde. See Almonds, Oil of.

Bitter Apple, or Bitter Cups. See Colocynth.

Bitter Ash. See Quassia.

Bitterfeld, tn., prov. Saxony, Prussia, 19 m. N.E. of Halle, with lignite mines, manufacture of drain-pipes and roofing felt, iron foundries, engineering shops, and steam-sawmills. Pop. (1900) 11,639.

Bitter Lakes, Great and Small. The smaller is 6 m. N. of Suez, Egypt; the larger lies between that lake and Lake Timsah. The two lakes form part of the Suez Canal.

Bittern (*Botaurus*), a genus of birds allied to the herons. The bittern is a nocturnal bird, which, like its allies inhabits swampy ground, and is remarkable for the booming cry uttered at the breeding season. The common American bittern (*B. lentiginosus*) is widely distributed on this continent, and allied species occur in most parts of the globe. A smaller and more yellowish species (*Ardetta exilis*) is also a familiar bird in similar haunts in N. America. In bitterns the prevailing tint is brown, with black streaks or markings. They nest on the ground in marshes, and lay several plain olive-green eggs. The European species has now become a rarity.

Bittern.

Bitter Root, range of mountains on the boundary line between Idaho and Montana, a part of the Rocky Mountain system, having an altitude ranging between 9,000 and 10,000 ft.

Bitters, a large and important group of drugs, including gentian, calumba, quassia, and others. Certain alkaloids have the general properties of bitters, in addition to their distinctive and more important characteristics. Their action begins in the mouth, where, by medicinal doses, the nerves of taste are stimulated, producing a flow of saliva, and thus assisting the first stage of digestion and increasing appetite. On reaching the stomach the bitter principle (berberine, quassin, quinine, or whichever may be present) acts directly on the gastric nerves, stimulating secretion and causing hunger, or, more accurately, the sense of hunger. Bitters, both in stomach and intestine, have also an antiseptic action, preventing fermentation and decomposition. In overdoses, or if too long used, they irritate rather than stimulate. They are anthelmintics, and for that purpose are used in injections. Advantage is taken of the stimulating properties of bitters in the well-known preparations angostura, calisaya and other bitters which are taken before meals. The bitter principle of hops is one of the most important ingredients in beer.

Bittersweet, or Woody Nightshade (*Solanum dulcamara*), a climbing plant common in the north temperate zone. Its stems, which die down every winter, bear lance-shaped leaves with two little wings at the base of each, small purple flowers, and poisonous red berries. An extract from the stem is used for rheumatism and certain affections of the skin. The shrubbery or climbing bittersweet, of North America, is *Celastrus scandens*, a woody vine, having conspicuous red and orange fruits in fall.

Bittersweet.
1, Fruit; 2, pistil; 3, stamen.

Bitterwood. See Quassia.

Bitumen, in its popular meaning, includes all those mineral products, of organic origin, which are characterized by a high percentage of carbon and hydrogen, by a powerful and peculiar smell, and by the facility with which they burn, giving off a heavy, sooty smoke. Among these are asphalt, naphtha, petroleum, pitch, elaterite, ozokerite, gilsonite, the so-called mineral resins, and the oils procured from marl and shale. The sp. gr. of bitumens is low; almost all of them float on water. See Asphalt, Petroleum, etc.

Bituriges, a powerful tribe in Aquitanian Gaul; their chief cities were Avaricum (Bourges) and Burdigala (Bordeaux). They were conquered by Cæsar.

Bitzius, Albert (1797–1854), was a Swiss Protestant minister who, under the name of Jeremias Gotthelf, wrote a long series of tales illustrating Swiss peasant life. He was minister of Lützelflüh, in the Emmenthal, from 1832 to his death, and his types are mostly taken from that district. His first work was *Bauernspiegel* (1837). Others are *Uli der Knecht* (1841), and its continuation, *Uli der Pächter* (1849); *Anne Bäbi* (1843–4), *Käthi* (1847), and *Geld und Geist* (1842). See new complete ed. with Life by Vetter (1898–1900); and *Life* by Bartels (1902).

Bivalves, or Lamellibranchs, are molluscs or shell-fish in which the shell consists of two valves placed at the right and left sides of the animal. The body is bilaterally symmetrical, and compressed from side to side; there is no distinct head region as in gastropods—*e.g.* the snail—and there are therefore no tentacles, no jaws, no salivary glands, and no radula or tooth-ribbon; the foot is ploughshare-shaped, and may contain a byssus gland; the gill filaments are often fused into plates, hence the name Lamellibranch. Other peculiarities are that the food consists of microscopic particles; there are usually two larval stages—the veliger and trochosphere; and the nervous system consists of three pairs of ganglia. Bivalves occur both in salt and in fresh water, but none are adapted for a terrestrial life. In the oyster, mussel, scallop, cockle, clam, we have forms of considerable commercial importance; while the pearl oyster (*Meleagrina*) is valued on account of the size, brilliancy, and color of the concretions or pearls formed around minute irritants introduced between the mantle and the shell. Many bivalves are boring animals, and contribute to the disintegration of rocks—*e.g.* Pholas; or, as in the case of the destructive teredo, or shipworm, undermine wooden piers and breakwaters, and attack wooden ships. In tropical regions the bivalves may reach a great size, as witness the giant clam (*Tridacna*), whose valves may measure two feet across. Though the majority are sedentary or slow-moving, the Limas and scallops are capable of swimming by means of rapid jerks.

Several different classifications of bivalves (order Pelecypoda) exist, but perhaps the most satisfactory is that based on the structure of the gills, according to which the existing forms fall into four orders:—

1. Protobranchia, those with simple gills, like the gills of gastropods—*e.g.* Nucula.
2. Filibranchia, those with gills consisting of long, reflected filaments only slightly connected with one another—*e.g.* Arca.
3. Pseudo - lamellibranchiata, those with the gill filaments loosely connected to form gill-plates—*e.g.* Pecten, oyster.
4. Eulamellibranchiata. The gills are double flattened plates, the separate filaments being no longer obvious. To this order belong most of the living bivalves—*e.g.* Pholas, Mya, and Anodon. See Cooke, *Molluscs* (1895).

Biwa Lake (Jap. *Biwa-ko*, 'a guitar'), in prov. of Omi, Japan, 10 m. N.E. of Kioto by river and canal; is drained by the Yodogawa R., which flows into Osaka Bay. It measures 36 m. in length by 12 m. in width, and is justly celebrated for its beauty, especially at the S. end. Lake Biwa Canal, 6 m. in length, connects it with Kamogawa Canal, and is utilized to drive the mills and factories of Kioto. According to the Japanese legend, the lake was produced by an earthquake in 286 B.C., which also upheaved the volcano of Fusiyama.

Bixa Orellana, a plant common in tropical America, and much cultivated in the W. Indies; belongs to the order Bixaceæ, of the violet group of orders. The seeds are protected by a red pulp from which is derived the dye annatto. The S. American Indians paint themselves with it.

Biysk, tn., Siberia, 270 m. S. of Tomsk, on r. bk. of Biya R., near its confluence with the Obi. A pass here crosses the Altai range into China. Pop. (1897) 17,206.

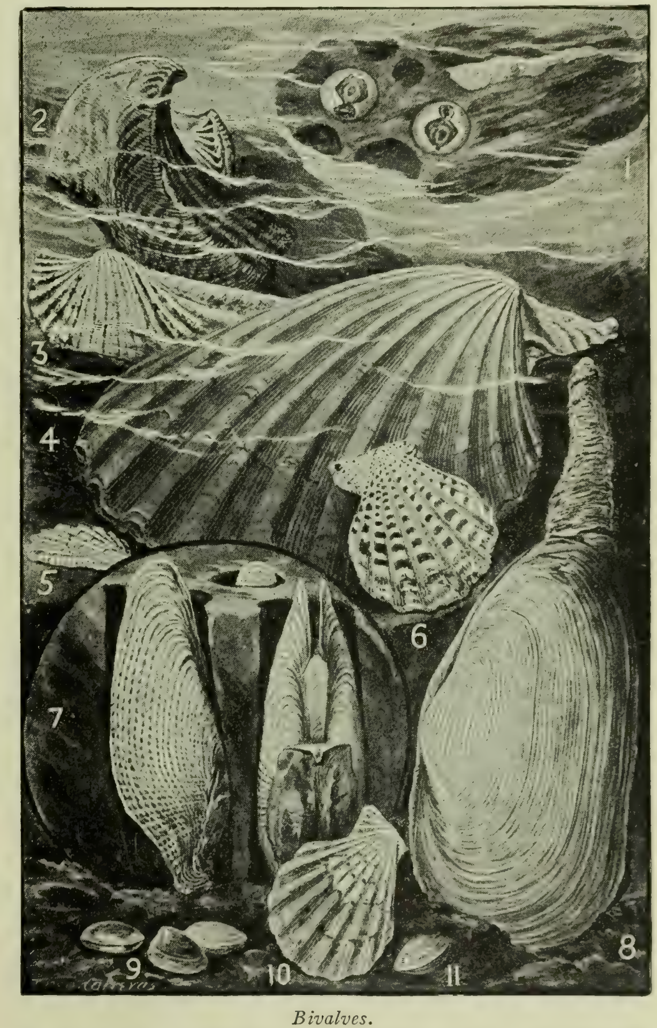
Bizerta (Fr. *Bizerte;* anc. *Hippo-Diarrhytus*), seapt. in Tunis, on the N. coast, 60 m. by rail N.W.

of Tunis. The harbor (1894) is a canal 30 ft. deep, connecting the sea and the Lake of Bizerta (31 m. in circuit), and opens into the sea by a tide-dock of about 3,500 ac. formed by two piers. The little native town and the European town both lie to the N. of the canal. Its fisheries are very productive. Bizerta is principally a naval station and port of call, and as a commercial port it competes with Tunis. It was occupied by the French in 1881. Pop. 10,000 (3,000 Europeans).

Bizet, ALEXANDRE CÉSAR LÉOPOLD, called GEORGES (1838–75), French musical composer, was born at Bougival, near Paris. He studied at the Paris Conservatoire under Halévy, and gained the Grand Prix de Rome in 1857. His operas, *Les Pêcheurs de Perles* (1863), and *La Jolie Fille de Perth* (1867), based on Scott's novel, and produced at the Théâtre Lyrique, exhibited strong traces of Wagnerian influence. *Djamileh* (1872) did not meet with much success, but *L'Arlésienne* (1872) was enthusiastically received. Bizet's great masterpiece, *Carmen*, performed at the Opéra Comique in 1875, and shortly afterward in Vienna, Brussels, Berlin, and London (1878), though at first a failure, has since become his most famous work. It had much influence on the development of the lyric opera. See *Lives* in French, by Pigot (1886) and Bellaigne (1891).

Björneborg, seapt., Finland, N.W. Russia, province of Abo-Björneborg, on the Gulf of Bothnia, 100 m. N. of Abo. Imports about $1,000,000 per annum; exports—wood, beer, oats, iron—about $2,500,000. The fisheries of Björneborg are important. Pop. (1897) 13,417.

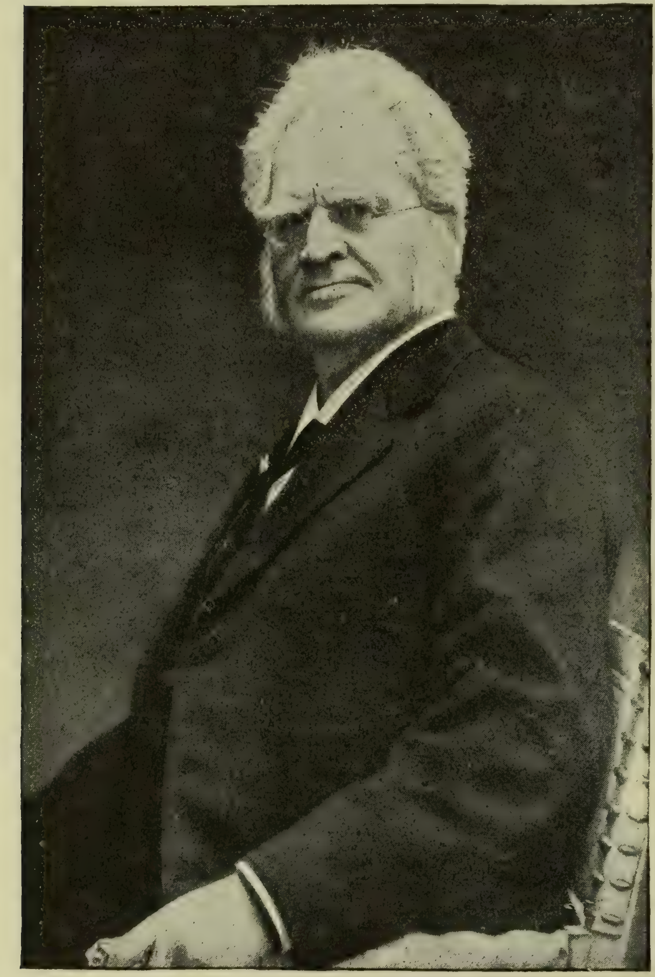
Björnson, BJÖRNSTJERNE (1832–1910), Norwegian poet, dramatist, and novelist, b. in Osterdalen, and educated at Moide and the University of Christiania. From 1857–9 he was director of the theatre at Bergen. His earliest and best works were his peasant stories, *Arne* (1858), *Synnöve Solbakken* (1857), *En Glad Gut* (1860), whose vigor and originality at once established his reputation. His earlier dramas, too (*e.g. Halte-Hulda* in 1859, *Mellem Slagene* in 1855), are full of force and beauty, and both tales and plays are distinguished by a terse style in which there is not a word too much. From 1860–2 Björnson lived principally at Copenhagen and Rome. In Italy he composed the drama *Kong Sverre* (1861) and the famous trilogy *Sigurd Slembe* (1862), two of the noblest productions of Norwegian literature. On his return to Norway in 1863 the Parliament granted him an annual pension in recognition of his literary merit; from 1861–7 he was director of the National Theatre at Christiania, and from 1866–71 editor of the *Norsk Folkeblad*, in which capacity he took an active part in politics on the Radical side, being a very eloquent public speaker. He was always a strenuous and somewhat violent partisan, and his anti-Swedish diatribes have done much to accentuate the differences between the Swedes and the Norwegians. The winter of 1880–81 was spent in a lecturing tour through the U. S. For a time (1882–8) he resided at Paris. Of his later works the best are the dramas *Maria Stuart* (1864) and *Sigurd Jorsalfar* (1872), the tales *Fiskerjenten* (1868) and *Brude-Slaatten* (1872), and the poetical romance *Arnljot Gelline* (1870). He had latterly written, though not with complete success, the analytic-psychological romance (*e.g. Det Flager i Byen og paa Havnen*, 1884; *Pa Guds Veje*, 1889), using social and religious questions as mediums for his advanced opinions; and in the same spirit, with more or less success, plays such as *En Fallit* (1874), *Redaktoren* (1874), *En Handske* (1883), *Geografi og Kjaerlighed*



Bivalves.

1. Shipworm (*Teredo navalis*), in floating wood. 2, 3. Ark-shells (*Arca*). 4, 5, 6, 10. Scallops (*Pecten*). 7. A stone-borer (*Pholas*) in rock. 8. Soft-clam (*Mya arenaria*) in mud. 9 and 11. *Nucula radiata*.

(1885), *Det ny System* (1879), *Over Ævne* (i. 1883; ii. 1895). But in the little tales *Mors Hænder* and *Een Dag* (published in *Nye Fortællinger*, 1894) he once again shows his original power. See his novels, in English, ed. Gosse (1895); Brandes's *Björnson og Ibsen* (1882); and the *Life*, written in Norwegian, by Ch. Collin. Also Boyesen, *Essays on Scandinavian Literature* (1895).



Björnstjerne Björnson, the Norwegian Novelist.

Björnstjerna, Magnus (1779–1847), Swedish statesman, born at Dresden. He fought (1813) in the battle of Leipzig against Napoleon, and countersigned the treaty (1814) uniting Norway and Sweden. He was ambassador to Great Britain (1828–46). He is author of *The British in E. India* (1839), *Hindu Theogony* (1843), both in Swedish, and *Anteckningar—i.e.* Notes (1851–2).

Black, Adam (1784–1874), Scottish politician and publisher, was born in Edinburgh, where he established the publishing house of A. and C. Black. His firm acquired (1827) the copyrights of the *Encyclopædia Britannica* and Scott's Waverley Novels in 1851. He was an uncompromising advocate of municipal and political reform. Twice elected lord provost of Edinburgh (1843–8). He represented that city in Parliament from 1856 to 1865. See Nicolson's *Memoirs of Adam Black* (1885); B. W. Crombie's *Modern Athenians*, ed. Scott Douglas (1882).

Black, Hugh (1869), American theologian, born in Rothesay, Scotland, educated at Glasgow University and the Free Church College, ordained in 1891, held charge at Paisley in 1891–96 and at Edinburgh in 1896–1906, became professor of practical theology at the Union Theological Seminary, New York, in 1906.

Black, James (1823–93), Amer. prohibitionist, was born at Lewisburg, Pa., and practised law at Lancaster in the same state. In 1846 he assisted in organizing the Sons of Temperance in Lancaster. He was prominent in all temperance movements, was an organizer of the Good Templars, and first proposed the establishment of a prohibition party. He was the first nominee of that party for president, in 1872. He wrote *A History of the Prohibition Party* (1880), and other volumes on the same subject.

Black, Jeremiah Sullivan (1810–83), American jurist, was born in the Glades, Somerset co., Pa., and was admitted to the bar of that county, 1831. He was appointed president-judge of his district as a Democrat, 1842, was a supreme court judge of Pa., 1851–7, in 1857 was made attorney-general of the U. S., became secretary of state in 1860, and endeavored to neutralize the efforts of the secessionists until the succession of Pres. Lincoln, when he retired. See *Essays and Speeches of Jeremiah Black, with a Biographical Sketch* (1885).

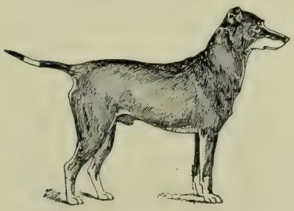
Black, John (1783–1855), Scottish journalist, was born near Dunse. In 1810 he went to London, walking all the way, and obtained a situation on the staff of the *Morning Chronicle*. He became a parliamentary reporter, and eventually edited the *Chronicle* from 1817 to 1843. He made several good translations from German, French, and Italian works, and wrote, in 1810, a *Life of Tasso*. Charles Dickens was one of his reporters, and he was on intimate terms with James Mill, Palmerston, and Brougham.

Black, Joseph (1728–99), chemist, of Scottish extraction, was born at Bordeaux. He became professor of chemistry at Glasgow (1756), and at Edinburgh (1766). His graduation thesis, on *Magnesia Alba* (1754), published in an extended form in 1756, announced his discovery of the distinction between 'fixed' and common air, and laid the foundation of quantitative analysis. He was the first to propound the theory of 'specific heat,' but he is better known as the discoverer of 'latent heat' in 1761. See Robison's Preface to Black's *Lectures on Chemistry* (1803); Grant's *Univ. of Edinburgh*, vol. ii., p. 395.

Black, William (1841–98), novelist, was born in Glasgow, where he studied art. In 1864 he removed to London, where he joined the staff of the *Morning Star.* He represented that paper during the Prusso-Austrian War of 1866; was for some time literary editor of the *Examiner*, and editor of the *London Review;* and finally became assistant editor of the *Daily News.* He abandoned journalism entirely in 1874. His first novel, *Love or Marriage*, was published in 1866, and was followed by *In Silk Attire* (1869) and *Kilmeny* (1870). *A Daughter of Heth* (1871; several editions), perhaps the best of his many stories, established his reputation. Among the most important of his works are *The Strange Adventures of a Phaeton* (1872), *A Princess of Thule* (1873), *Madcap Violet* (1876), *Macleod of Dare* (1878), *White Heather* (1885), *In Far Lochaber* (1888), *Briseis* (1896), and *Wild Eelin* (1898). A monograph on *Goldsmith* appeared (1887) in the 'English Men of Letters Series.' As a novelist his strength lay in descriptions of Highland scenery, fishing, and yachting. A lighthouse to his memory was erected at Duart Point on the Sound of Mull in May, 1901. See Wemyss Reid's *Life* (1902).

Black Act, an act passed in 1722, punishing, as felons, marauders who (*e.g.* in Epping Forest) with blackened faces went about robbing and blackmailing. It was repealed in 1827. The name Black Acts is also applied to acts of the Scottish Parliament (1424-1594) printed in black letter.

Black-and-Tan Terrier is bred in two varieties—the ordinary, which weighs up to twenty pounds; and the toy, which must be under seven pounds. Points: head long and narrow, flat from the base to the nose, with no bumps at the sides or cheeks; muzzle long and tapering, but not weak; eyes small and black; correct carriage of ears debatable, but drop-ear favored; neck light and graceful; shoulders sloping; chest rather narrow, yet deep, and the body slightly arched, with good back ribs; fore legs quite straight, with well-arched toes and jet-black nails; hind quarters rather powerful, with hocks well let down; tail very fine, and carried straight; coat short and close; color black, with rich tan markings along the jaws, breast, on the insides of the hind legs, under the vent, and on the fore legs up to above the pastern joint. The toes, however, have black lines, called pencilling, running up them, and there is a black spot, the 'thumb mark,' just along the pastern joint, in front of the limb. Points for the toy variety precisely the same.



Black-and-Tan Terrier.

Black Art. See Magic.

Black-Ash. See Sodium Carbonate and Alkali.

Black Assizes, a pestilence which appeared at the conclusion of the assizes at Oxford, July 6, 1577. Between that date and the 12th August following, 300 people, including the high sheriff and other officials died.

Blackberry, the fruit of various species of Rubus. The berries are black in color, and the drupelets of which cling to their receptacles until decayed. They include the high or bush blackberries and the trailing varieties, often called dewberries. All are shrubs, generally very prickly, and grow in various kinds of soil. The fruit ripens from July to September.

The most important blackberries in cultivation are derived from *R. nigrobaccus* (formerly known as *R. villosus*), which is indigenous to North America. It is upright, and tall, with long-stalked, taper-pointed leaflets, and white flowers. The cultivated varieties include: 1, long cluster berries, of which the Taylor is a good representative; 2, the short cluster (the Lawton and Snyder); 3, the leafy cluster (Early Harvest); 4, the loose cluster (Wilson). The sand blackberry (*R. cuneifolius*) is small, with recurved thorns and wedge-shaped leaflets, and is known in cultivation as the Topsy or Tree blackberry. This type of blackberries is propagated by suckers, spreading rapidly under favorable conditions, the old canes being removed each year. They are usually hardy, but seem to require a little protection in the far North.

Low Blackberry or Dewberry.

The dewberries (*R. villosus; R. invisus, R. trivialis* and *R. vitifolius*) have only lately been cultivated, and with varying success. They have a trailing habit, propagating at the tips, rather than by suckers, and produce fruit earlier than do the high blackberries. They are apt to grow, when wild, in warm sand, and the fruits have few but very large and sweet drupelets.

High Bush Blackberry.

The European bramble (*R. fruticosus*) is also called blackberry, with fruit ripening in late autumn, and much smaller than that of the American species.

Blackbird, a name given in various parts of the world often to very different birds, whose plumage is prevailingly black. The blackbirds of the United States and Canada are of the family

Icteridæ, related to the starlings, and consist of several species of large size, half as big as a crow, the males wholly black, and called 'crow blackbirds'; also of a smaller species, the cow-bird (*Moluthrus ater*), other species of which are numerous in S. America; also the red-winged blackbird, notable for gathering in autumn in great flocks on prairies and marshes. All are migratory, nest in bushes and trees, lay greenish eggs heavily marked with spots and lines, and have their females and young brown. They utter rough cries rather than a song. The cow-birds are further exceptional in laying pepper-dotted eggs, one at a time, in the nests of other birds, like the European cuckoo. The Mexican or Savanna blackbird is the ani (q.v.), a relation of the cuckoos. The East Indian blackbirds are grackles. The British blackbird is a favorite European song-bird, and one of the thrushes closely allied to the N. American robin.

Blackbirds, Field of, or Kossovo Polje, a small plain in Turkey in Europe, in the vilayet of Kossovo, stretching s. from Pristina; was the scene of two great battles—(1) in 1389, when Sultan Murad I. defeated the Servians and overthrew their ancient kingdom, Lazar, their king, perishing in the battle; (2) in 1448, when John Hunyady of Hungary was defeated and captured by Sultan Murad II. and George Brancovics, prince of Servia.

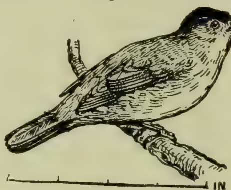
Blackbuck, the common antelope of India (*Antilope cervicapra*), so called by sportsmen with reference to the shining brownish-black of the coat of the male, the females and young being light brown. The bucks have long spiral horns, from 16 to 25 inches long, and furnish excellent sport in all the open parts of India. See Antelope.

Black Bulb Thermometer (also called *in vacuo* or radiation thermometer) is a sensitive maximum registering thermometer, having the bulb and a portion of the stem covered with lampblack, the whole being enclosed in a glass tube from which all moisture and air have been removed. The instrument is fixed horizontally four feet above the ground, at a distance from walls or trees which may obstruct the full rays of the sun. The difference between the maximum temperature which it registers in the sun and the corresponding maximum in shade gives a rough measure of the amount of solar radiation.

Blackburn (ac. 48,281), par., munic. and co. bor., Lancashire, England, 9 m. E. of Preston and 21 m. N.W. of Manchester, and on Leeds and Liverpool Canal. From 1650 it was famous for Blackburn 'checks,' and afterward, till 1764, for Blackburn 'grays.' After that year it began to take a foremost place in cotton-weaving, and is now the centre of the Lancashire cotton spinning and weaving industries, with 140 mills and over 55,000 looms. Here, in 1764, Hargreaves invented his 'spinning jenny.' The grammar school was founded by Queen Elizabeth in 1567. The Corporation Park and the Queen's Park are well laid out and extensive. At the sewage works precipitation is accomplished by means of ferozone, and the sediment is made into manurial cakes. Besides cotton mills there are engineering works, breweries, etc. Pop. (1831) 36,629; (1871) 76,337; (1891) 120,064; (1911) 133,064.

Blackburn, Joseph Clay Styles (1838), American lawyer and legislator, was born in Woodford co., Ky., and was educated at Centre College. He was admitted to the bar in 1859, practised in Chicago, and served in the Confederate army during the Civil War. He afterward practised law in Ky., was a member of the state legislature in 1871-75, and of the House of Representatives in 1875-85. He served in the U. S. Senate in 1885-97, and was again elected in 1901 for the term ending in 1907, but was defeated for re-election. He was appointed a member of the Isthmian (Panama) Canal Commission in 1907.

Blackcap (*Sylvia atricapilla*), a small British song-bird, and one of the sweetest and cleverest of feathered songsters, the male of which has a black head. The blackcap is closely allied to the thrushes, and is a migrant.



Blackcap.

Blackcock, also Heathcock, a name strictly applicable to the male only of the true or black grouse (*Tetrao tetrix*), the female being called grayhen. The black grouse ranges through N. Europe and Asia, and is common in Scotland, and is a favorite game-bird. The male is remarkable for the lyrate tail and peculiar courting display, which is carried on in the early morning, and is accompanied by a drumming noise. The diet is varied, but is chiefly vegetable.

Black Country. See Staffordshire.

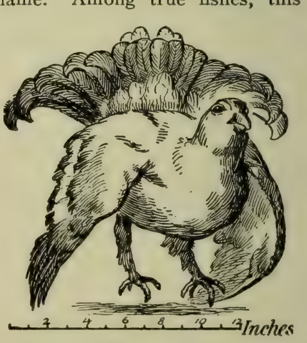
Black Death. See Plague.

Black Earth, a fertile soil of the nature of loess; its dark color being due to organic matter. It is noteworthy for yielding abundant crops. It lies spread over wide areas in the regions of the Dnieper, Don, Volga, and Vistula. Similar kinds of soil are known also in Siberia and in Texas.

Blackfeet, or Siksika, a large division of the Algonquin linguistic stock formerly ranging from the Missouri river north to the Saskatchewan along the slopes of the Rocky Mountains. They are divided into three groups: the Blooch, the Piegans, and Blackfeet. At one time they were very powerful and owned great herds of horses, but the smallpox broke out among them about 1840 with such deadly effect that they never afterward gave the U. S. or Canadian government serious trouble. While they lived upon the buffalo and possessed the same general culture as the Plains Indians, they practised a highly developed form of ceremonial religion in which bundles of sacred objects with long rituals were a special feature. At present they reside upon reservations in Montana and Alberta, engaged in stock raising.

The name is also applied to a small division of the Teton, a subdivision of the Dakota Sioux. See Grinnell's *Blackfoot Lodge Tales* (1903); Coues's *New Light on the Early History of the Greater Northwest* (1897); Petitot's *Vocabulaire Pieganiw* (1885).

Blackfish. The name of various fishes and fish-like animals prevailingly black in color. Thus several of the killer-whales of the genus Globiocephalus are so called by both British and American fishermen, especially the ca'aing whale or bottlehead of the north-eastern Atlantic. Sailors also called various grampuses by this name. Among true fishes, this name is given locally in the east to the tautog, to a sea-bass and some others; and in Alaska to a small fresh-water fish (*Dallia pectoralis*),



Blackcock.

which ascends the rivers in vast numbers to spawn, and is caught and preserved by the natives, to whom it is very valuable as a food resource.

Black-fly, a blackish gnat of the family Simuliidæ which swarms in the forests of Canada and the N.E. United States in the hotter parts of summer, and often becomes an almost unendurable torment.

Black Forest (Ger. *Schwarzwald*), a mountainous wooded region in S.W. Germany; stretches through the grand-duchy of Baden for a distance of 100 m., with a breadth of 20 to 40 m., along the r. bk. of the Rhine, parallel to the similar range of the Volges on the l. bk. It is a region of lovely valleys winding among wooded heights (highest alt. 4,900 ft., in the Feldberg), and is inhabited by an industrious race of woodcutters and lumbermen, and makers of wooden clocks, barrel organs, musical boxes, and straw hats. The Black Forest is one of the favorite summer resorts of the Germans, and is also of great strategic importance as a barrier to the direct passage of troops east or west between S. Germany and Alsace and France, the principal bulwark being the intrenchments (1704) of Kneibis (3,180 ft.). In 1796, however, Moreau twice forced his way through its network of narrow valleys. In German legend and literature, too, the Black Forest plays no inconsiderable part. It is the home of many quaint legends. Auerback made it the scene of his peasant stories (*Schwarzwälder Dorfgeschichten*, 1843–53), and its scenery and life form the substance of J. P. Hebel's dialect poems, *Alemannische Gedichte* (1803).

Black Hand, a symbol used by members of a wide-spread Italian society, and affixed to blackmailing letters containing threats of personal injury and even death on failure of compliance. Recently the outrages committed and terror inspired by the society in the United States have led influential Italians in many large cities to organize White Hand societies to aid the authorities in suppressing the desperadoes of the Black Hand. In N. Y. City Italian detectives have been useful in discovering offenders.

Black Hawk War, a minor Indian war in the U. S. (1832), the Indians (Sacs and Foxes) being led by Black Hawk (1767–1838), who had opposed the treaties of 1804, 1816, and 1830, by which the Sacs and Foxes had alienated large portions of their lands, the main body of the tribes under Keokuk acquiescing in the cessions. The war began by Black Hawk's crossing of the Mississippi river into lands formerly occupied by the Indians; and was ended, after several minor engagements, by the defeat of the Indians and the capture of Black Hawk (Aug. 1 and 2, 1832) near the mouth of the Bad Axe river in Illinois. Black Hawk was, however, released in the following year, and died at Des Moines, Iowa, in 1838. In the war, 1,340 U. S. regulars and 5,368 U. S. volunteers were engaged, and about 65 men were killed or wounded.

Blackheath, an elevated common in Kent, England, 5 m. S.E. of London, and near Greenwich Park; 70 acres. On it stands Morden College, founded in 1605 for decayed merchants who had been engaged in the Levant trade. The Danes encamped on it in 1012, and here Wat Tyler (1381) and Jack Cade (1450) assembled their followers. In the end of the 18th century the common was much frequented by highwaymen. Golf was first played on the common about 1608.

Black Hills, group of mountains mainly in the W. part of S. Dakota. It is an elliptical uplift, about 6,000 sq. m. in area, from the summit of which the more recent stratified beds have been eroded away, in the W. part down to the underlying Carboniferous rocks, in the E. part to the underlying granites. The remains of these younger beds surround the mountain group quite continuously in the form of ranges of hog-backs. The highest summit, Harney Peak, has an altitude of 7,216 ft.; average elevation, 2,500 to 3,000 ft. The region is one of the richest gold-producing districts in the United States, and contains also numerous other metals. The group obtains its name from the black pine forests, with which it is extensively covered.

Black Hole. See Calcutta.

Blackhorse, one of the edible suckers (*Cycleptus elongatus*) of the rivers of the Mississippi valley, which is almost jet black, and is among the food-fishes caught for market in spring in large numbers.

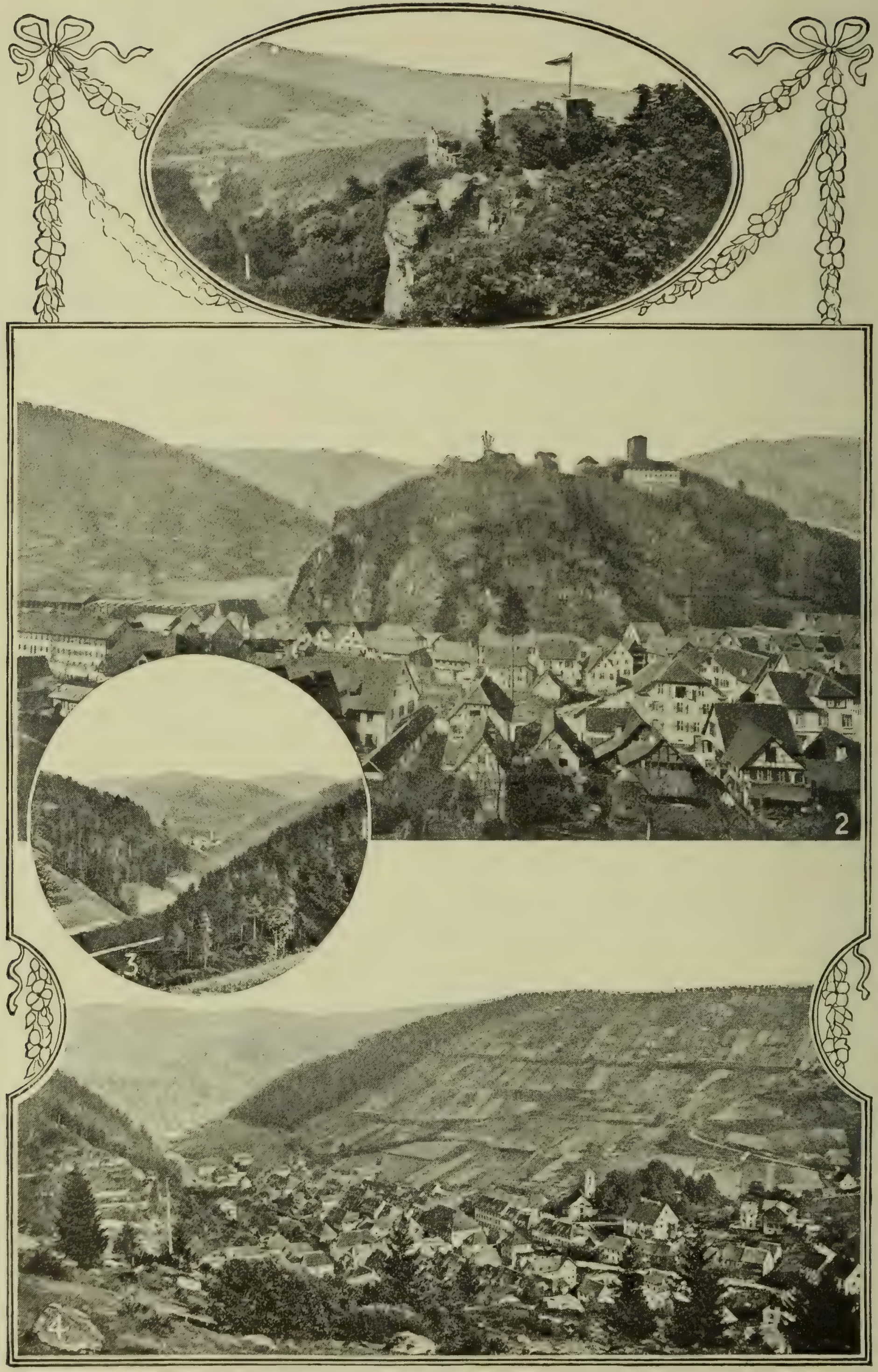
Blackie, John Stuart (1809–95), Scottish author and professor, was called (1834) to the Scottish bar, but soon devoted himself to literature, executing a translation, in verse, of Goethe's *Faust* (1834). From 1841–52 he held the chair of humanity in Marischal College, Aberdeen, and from 1852-82 that of Greek in Edinburgh University. He was an ardent student of many subjects—political, scholastic, philological, and moral. He succeeded (1874–6) in raising $60,000 for the foundation of a Celtic chair at Edinburgh. Blackie was a voluminous writer. His chief works were a metrical translation of *Æschylus* (1850); *Songs and Legends of Ancient Greece* (1857); *Homer and the Iliad*, in 4 vols. (1866); *Self-Culture—Intellectual, Physical and Moral* (1877); *War Songs of the Germans*, a translation (1870); *Lays of Highlands and Islands* (1872); *The Language and Literature of the Highlands of Scotland* (1875); *The Wisdom of Goethe* (1883); *Life of Robert Burns*, in the 'Great Writers Series' (1888); *Scottish Song* (1889); *Christianity and the Ideal of Humanity* (1893). See *Life* by Anna M. Stoddart (2 vols. 1895).

Blacking. The use of blacking and other polishes for leather dates back to the times of the ancients, but the compound now known as such was introduced into Great Britain from Paris in the reign of Charles II. The manufacture is now of considerable extent, as various polishes are required for the different leathers used for harnesses, shoes, etc.

Black Isle, peninsula separating Cromarty Firth from Beauly and Moray Firths, Ross-shire, Scotland. A branch of the Highland Ry. traverses it in a N.E. direction from Muir of Ord to Fortrose.

Black Lead, Plumbago, or preferably Graphite, an allotropic form of carbon, found in mica-schist, gneiss, granite, meteoric iron, argillite, etc., in beds, sheets, detached masses, and crystals, in Siberia, Ceylon (chief source of black lead in commerce and the arts), New Brunswick and other parts of Canada, New Zealand, and Germany. It is a stove and grate polish, and a lubricant in machinery, but black lead is most used in the manufacture of pencils and crucibles. It is also used as an inner covering of electrotype moulds, and for conductors of electricity. It can be obtained artificially by crystallizing any form of carbon from its solution in molten iron, and is prepared commercially by heating coke in the electric furnace. Graphite is a soft, dark gray, opaque solid, of a greasy metallic lustre. It crystallizes in hexagonal plates, and is volatile only at the temperature of the electric arc. It is a fair conductor of heat and electricity, and, though it can be burnt to carbon dioxide, is less combustible than diamond. On oxidation with nitric acid and potassium chlorate it yields graphitic acid.

Black Letter, a name invented in the 17th century for the types imitated from the handwriting in use in England in the 15th century, as contrasted with those founded on the Roman or Italian hand revived by the Italian scholars of the Renaissance. All Caxton's books are printed in black letter, and his immediate successors only used the Roman types for books in Latin. Except



SCENES IN THE BLACK FOREST.

1. Baden Baden and the Altes Schloss 2. Harnberg 3. Nussbach. 4. Triberg

for large Bibles, for proclamations, and cheap broadsides, in which it lasted nearly a hundred years longer, black letter gradually died out during the 16th century, the last important book of secular literature printed in it being the 1602 edition of Chaucer. It is now chiefly used in headlines and in fancy printing, but was revived by William Morris in many of the books printed at the Kelmscott Press. It is now known to practical printers as Old English or Elizabethan. See Duff's *Early English Printing* (1896).

Black List. In Great Britain, printed lists abstracted from public records, of English, Scottish, and Irish bankruptcies, insolvencies, liquidations, bills of sale, protested bills, assignments, judgments for debt, and other information affecting the financial standing of firms and individuals, issued weekly or biweekly, and circulated in private for guidance in mercantile transactions. The Scottish trade protection societies, from the middle of the 18th century, were among the first to supply such information. In the United States institutions known as commercial agencies are established in all commercial centres for furnishing similar information. In this country the term is more commonly applied to lists of discharged employees kept by employers of skilled labor and furnished by them to other employers in the same line of business, or to lists kept by labor unions of non-union workmen, or of persons employing the latter, or of the persons denominated 'scabs' and 'strike-breakers' with the view of enforcing some species of boycott or terrorism against the blacklisted persons. This form of blacklisting has in some states been made a criminal offence by statute.

Blackmail. In early English law, rents payable in cattle or produce, as distinguished from rents payable in white money or silver, called white mail. At a later period the same term was, probably at first as a joke, applied to the compulsory tribute of cattle and produce levied on the inhabitants of the northern counties of England by marauders from across the border. By a further extension of meaning the expression has come to denote the criminal offence of extorting money or property by threats of exposure for some real or imagined wrongdoing, or of injury to person or property. The offence is a grave one and is severely punishable by fine and imprisonment.

Blackmore, SIR RICHARD (d. 1729), English court physician and author, was born in Wiltshire. He was a voluminous writer of poetry and prose, of medical treatises and controversial divinity. *Prince Arthur,* a tedious compilation of verse, appeared in 1695. His *Satyr against Wit* (1700) provoked many enemies. His *Creation* (1712), a philosophical poem, was praised by Addison and Johnson. He also published *Modern Arians Unmasked* (1721), *National Theology* (1728), *Discourse on the Plague* (1720), and *Treatise on the Smallpox* (1723). See Johnson's *Lives of the Poets* (1779–81). He is not unjustly ridiculed by Pope in the *Dunciad.*

Blackmore, RICHARD DODDRIDGE (1825–1900), English novelist. *Clara Vaughan,* his first novel, appeared in 1864, succeeded in 1865 by *Cradock Nowell,* a work distinguished by its beautiful studies of New Forest scenery. *Lorna Doone,* a romance of Exmoor, and the author's most popular work appeared in 1869. The characters are cast in the true heroic mould, and the story is told in a masterly manner. The *Maid of Sker* (1872) is scarcely less vigorous. It was followed by *Alice Lorraine,* a tale of the South Downs (1875); *Cripps the Carrier,* a woodland tale (1876); *Erema,* a strong and weird story (1877); *Mary Anerley* (1880); *Christowell,* a tale of Dartmoor (1882); *Springhaven,* with glimpses of Nelson (1887); *Kit and Kitty* (1889); *Perlycross,* a story of the western hills (1894); *Fringella,* some tales in verse (1895); *Tales from the Telling House* (1896); and *Dariel,* a romance of Surrey (1897). Blackmore's novels are distinguished for their fidelity in the delineation of nature, and intimate acquaintance with the people and customs of the west and south of England. For many years he carried on the business of market gardening.

Black Mountains, a short range of mountains in N. Carolina, a part of the Appalachian system. Mount Mitchell (or Black Dome), which has an altitude of 6,711 ft., is the highest peak in the U. S. E. of the Mississippi R.

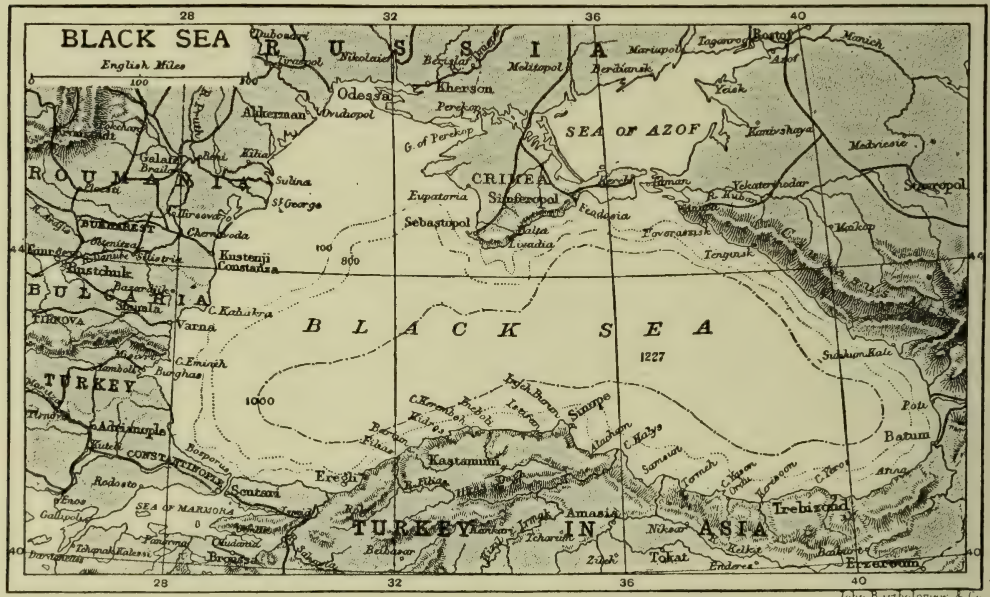
Black Prince, EDWARD, THE (1330–76), eldest son of Edward III. of England; created Duke of Cornwall (1337) and Prince of Wales (1343); commanded the van at Crécy (1346); said to be so called the Black Prince from the color of the armor he wore at this battle; defeated and took captive John, king of France, at Poitiers, and brought him to London; created Prince of Aquitaine and Gascony (1362); defeated Henry of Trastamare at Najara (1367); relinquished the principality of Aquitaine and Gascony (1372). He was buried in Canterbury Cathedral.

Black River, or BIG BLACK R., a l. bk. trib. of the White R., which heads in S.E. Mo. and flows in a general S.S.E. direction to the boundary of Arkansas, and thence S.S.W. to its confluence with the larger stream near Jacksonport. It is about 400 m. long.

Black River, an east affluent of Lake Ontario. It rises in Hamilton co., N. Y., crosses Herkimer, a corner of Oneida, Lewis and Jefferson cos. It is navigable for 40 m. from the mouth, and connects, through the Black Canal, with the Erie Canal. Lyons Falls in the S. of Lewis co. is 60 ft. high. The river is about 200 m. long.

Black Rod. The gentleman usher of the Black Rod is usher of the Order of the Garter. His symbol of office is a black rod surmounted by a gold lion. He is also an officer of the House of Lords. He, or his deputy, the yeoman usher, acts as messenger when the Lords desire the attendance of the Commons. He has the custody of persons committed for breaches of privilege or contempt, and assists at the introduction of peers and at other ceremonies.

Black Sea (anc. *Pontus Euxinus*), an enclosed sea in the S.E. of Europe, having Russia on the N. and E., Asia Minor on the S., and Turkey, Bulgaria, and Roumania on the W. Its shores are high where they abut upon the Caucasus region, and upon the slopes of the Istranja Mts. in Turkey. It measures some 700 m. from E. to W., and 350 m. from N. to S., and its area is estimated at 139,300 sq. m. It is a steep-sided basin with a nearly flat bottom. Immediately E. and W. of the peninsula of the Crimea, which projects into it from the N., its waters are shallow for some distance from the shores, owing to the large deposits of sedimentary matter there laid down by the rivers—the Kuban and the Don pouring into it through the Sea of Azov, and the Dnieper, Bug, Dniester, and Danube entering on the N.W. In other parts of the sea the 100-fathom line runs close to the shores, and parallel with them. Between the 100-fathom line and the 800-fathom line the slope is in general very steep, and from the 800-fathom line the depth increases very gently down to the maximum of 1,227 fathoms in the centre of the basin. During the summer there is a thin stratum of relatively warm surface water (55.4° F. in May to 78.8° in August) resting upon an almost equally thin layer of colder water (mean temp. 47.7°), below which, again, there is the bulk of the sea with an almost uniform temperature throughout of 48.2°. The Black Sea is not only subject to annual fluctuations of level, ranging from 3½ to 6½ in. above the mean level of the year in May and June down to 2½ to 4 in. below that level in October and in February, but it also seems to fluctuate over unequal periods, in close dependence upon the volumes of rainfall which come down over its drainage basins. The restriction of the circulation to the thin upper strata is, on the whole, inimical to marine life, and is conducive to the formation in the deep parts of the sea of vast quantities of sulphuretted hydrogen, as well as of chemical precipitations on its floor. The only forms of life which thrive in these waters belong to very lowly species. The Black Sea is practically destitute of islands, and seldom freezes, even along the shores. A scheme has been proposed (1904) for uniting the Black Sea and the Baltic by establishing canal connection between the Dnieper and W. Dwina, by means of the rivers Lutscheza and Orschiza and a canal 12 m. long. The treaty of Paris (1856) provided for the neutralization of the Black Sea by excluding from it ships of war of every flag, and Russia and Turkey agreed to abstain from establishing maritime arsenals on its coasts. The latter provision was abrogated in 1871, and it was then declared that while the established principle of closing the straits (recognized by treaty in 1841) is maintained, power should be given to the Sultan to admit, in time of peace, the warships of friendly or allied powers if the Porte should consider such a course necessary, in order to secure the stipulations of the treaty. In the 18th protocol of the treaty of Berlin (1878) Lord Salisbury made a declaration which apparently reserved liberty to British ships of war to enter the straits with the consent of the Sultan. See Sir John Murray, 'On the Deposits of the Black Sea,' in *Scot. Geog. Mag.*, 1900, pp. 673–702; and consult also *Geog. Jour.*, 1893, pp. 49–51, and *Petermann's Mitteilungen*, 1891, pp. 33–37.



John Bartholomew & Co

Black Sea Government, or CHERNOMORSKAYA, a narrow strip of country in Transcaucasia lying along the north-east coast of the Black Sea. The country is mountainous. The temperature is high and the rainfall heavy. Novorossisk is the one great port. Area, 2,837 sq. m. Pop. 54,228, chiefly Russians.

Blacksnake. The most common of the larger colubrine snakes of North America (*Zamenis constrictor*), when adult black in color throughout on the upper surface, becoming slaty along the abdomen and with a white chin; but in the Southern and Western states a greenish or bluish hue prevails instead of pure black, and hence the snake is locally known as blue or green racer. The young are dusky and blotched. It often reaches and occasionally exceeds six feet in length; and is extremely swift and agile, frequently climbing to the top of tall trees or exploring the rafters of buildings. It preys upon frogs, toads, other snakes (including the poisonous kinds, which it overcomes by its quickness of attack and the crushing power of its coils), and upon small birds, fledglings, eggs and insects. It is harmless, although pugnacious when attacked, and many specimens have been tamed and taught to know and follow their owners. These snakes are numerous in one or another variety throughout all the warmer parts of North America. The female lays 15 to 20 eggs in manure piles, rotting logs, and similar situations, where she burrows a little beneath the surface and leaves her eggs to be hatched by the warmth of the sun-heated materials. See Cope, *Crocodilians, Lizards and Snakes* (1898).

Blackstone, tn., Worcester co., Mass., 20 m. S.E. of Worcester, on the Blackstone R., and on the N. Y., N. H. & H. R. R. It has manufacturing interests, the most important being cotton. It has a public library. Pop. (1910) 5,648.

Blackstone, SIR WILLIAM (1723–80), writer on English law, the son of a London silk mercer, was educated at Charterhouse and Pembroke College, Oxford, obtaining a fellowship at All Souls College, Oxford (1744). Although called to the bar in 1746, he was not very successful in practice. In 1759 he published an edition of the Great Charter, with a valuable introduction. With great courage he began to deliver voluntary lectures on English law at All Souls, and his enterprise was rewarded with the newly-founded Vinerian professorship in 1758. The publication of his famous *Commentaries*, based upon his Oxford lectures, followed in the year 1765–70. They had an immediate and overwhelming success. Their great merit is the admirable way in which the author handles an immense mass of materials, and unloads it gently upon the reader, in such quantities as the average man can bear. After having acquired reputation as a lecturer, Blackstone returned to practice, and soon gained a lucrative position. He refused the chief-justiceship of the Irish Common Pleas in 1761, being made principal of New Inn Hall in that year. In 1763 he became solicitor-general to the queen; he was already a member of Parliament, but did not distinguish himself in that capacity. In 1770 he was made a justice of the Common Pleas in England; and though he was removed to the King's Bench almost at once, he returned after a short time. He was an indifferent judge, hesitating and formal. Blackstone's only works of permanent value are the *Commentaries of the Laws of England*, and *Reports*, prefixed to which is a Life by J. Clitherow (1813). The last English verbatim edition of the *Commentaries* appeared in 1844, but an edition was printed in the U. S. in 1884, and the best edition of all by Lewis in 1898.

Blacktail. The common name in the West for two North American deer: (1) the mule deer; and (2) the Columbian blacktail. In both cases the name is due to the blackness of a part of the tail as contrasted with the conspicuous white tail of the Virginian deer. The mule deer is elsewhere described (see DEER; MULE DEER). The true blacktail is a smaller, long-eared deer of the Pacific coast from northern California to British Columbia, which has very similar habits to the mule deer, except that it is necessarily an animal of the wooded valleys, ascending in summer to timber line. See Roosevelt (and others), *The Deer Family* (1902).

Blackthorn, or SLOE (Lat. *Prunus spinosa*). A European shrub, of the rose family. In spring it produces miniature white, hawthorn-like sprays of flowers in profusion before the leaves expand; its branches form hard thorns; its bark is black, hence the name; and in fall its fruits or sloes ripen: they are elliptical, black, with a plumlike bloom on the skin, and sour.

Black Vomit. See YELLOW FEVER.

Blackwall, dist. of London, par. of Poplar, containing the E. India Docks and large shipbuilding yards. Blackwall Tunnel affords communication between Blackwall and E. Greenwich. It is 6,200 ft. in length, 1,220 ft. being beneath the river.

Black Warrior, an American merchant vessel, trading between N. Y. City and Mobile, Ala., which, stopping at Havana, Cuba, in transit, was seized (Feb 28, 1854) by the Spanish authorities in Cuba on the ground that she had violated the regulations of the port, in not manifesting her cargo. The vessel was soon released, but great excitement was caused in the United States by her seizure, and a demand was made upon Spain for redress. This demand was presented with undue insistence by Pierre Soulé, the American minister at Madrid, and was met by a virtual refusal. Certain Southern leaders, desirous of obtaining Cuba, tried to make the affair the occasion of a war with Spain, but the North, angered by the Kansas-Nebraska Bill, which was then before Congress and which became a law on May 30, 1854, refused to join in a clamor for hostilities, and war with Spain was avoided. See Rhodes's *History of the United States from the Compromise of* 1850 (vol. ii. 1893.

Black Warrior, river in Alabama, rising in the northern part of the state and flowing into the Tombigbee in the southern part of Greene co. It is nearly 300 m. long and navigable to steam vessels to Tuscaloosa.

Black Water. See SHEEP.

Blackwater, the name of fifteen rivers and streams in the United Kingdom, the most important of which are:—(1.) River in Munster, Ireland; rises on borders of Cork and Kerry, and after a course of 100 m. falls into Youghal harbor. It is navigable to Cappoquin, 16 m. from the mouth. Next to the Shannon it is the largest river in Ireland. (2.) River in Ulster, Ireland; after a course of about 50 m. falls into Lough Neagh. (3.) River in Essex, England; rises near Saffron Walden, and enters the North Sea after a course of about 40 m.

Blackwater Fever is a tropical disease of a malarial type, which has been described under many different names, generally suggested by prominent signs or symptoms—*e.g.* hæmoglobinuria, hæmatinuria, bilious hæmaturic fever, hæmorrhagic malarial fever, yellow remittent fever, bilious remittent fever, and melanuric fever.

It is an acute infectious fever, accompanied by rapid and great destruction of red blood corpuscles, starting very often, like most fevers, with general malaise, followed by a severe rigor and rise of temperature, which may soon reach as high as 105 or 106°. Great nausea is characteristic, with a vomit which passes from yellow to dark green. The urine quickly red, passing to the darkness of porter. Meanwhile pain appears in the hypochondriac region and the loins; and on palpation the liver and spleen are found to be swollen and tender. The skin and the conjunctivæ rapidly assume a jaundiced yellow color. Constipation is usual, but diarrhœa is not uncommon. Very often in a few hours there are profuse perspiration and a fall of temperature, with clearing of the urine, or free flow if it has been suppressed, but generally a few hours more will bring another rise of temperature, and an aggravation of all the symptoms. A paroxysm may occur every few hours for a few days, or one a day may be the rule, or there may be intervals of one or two days between the attacks. Within a week the patient may be rid of it; or his strength may fail, sometimes quickly, sometimes in five or six days, with fatal results. Relapses, even months after the first attack, are very common.

Blackwater fever is prevalent all through tropical Africa, Madagascar, Sicily, Sardinia, the Greek Archipelago, India, and some parts of South America. It has been considered essentially a malaria, but in suitable districts it seems likely to attack any whose health is below par from any cause whatever without any previous malarial attack. Some, again, have held it to follow on the excessive use of quinine, and to be, in fact, a quinine poisoning.

Treatment.—No quinine should be given. The patient should go to bed, have hot fomentations over the liver and spleen, copious hot alkaline drinks, and a free purge. No solid food should be taken during the attack, and no alcohol unless for extreme weakness. In E. Africa and in Dahomey it has lately been ascertained that the natives use decoctions of cassia with considerable success. See Sambon's article in the *Encyclopædia Medica;* Cantlie's and Gilman Thompson's in the *Medical Annual*, 1901.

Blackwell, ELIZABETH (1821), Anglo-American physician, was born at Bristol, England, was brought to the U. S. in 1832, and after her father's death taught school in Cincinnati and elsewhere, meanwhile pursuing medical studies under private instruction. After being refused admission to several medical schools on account of her sex, she was finally admitted to the medical school at Geneva, N. Y., where she took her degree of M.D. in 1849, and established a record for this country in that respect. She pursued her studies in Paris and London, and began practice (1851) in New York, where she organized (1854) the N. Y. Infirmary for Women and Children, and was active in organizing the women's relief association for sending nurses and supplies to the front in the Civil War. Dr. Blackwell zealously promoted medical education for women, and saw it generally established. After 1869 she practised in London and Hastings, England. Author of *Pioneer Work in Opening the Medical Profession to Women* (1895), and works on the training of the young.

Blackwell, THOMAS (1701–57), British classical scholar, born in Aberdeen; was appointed professor of Greek at Marischal College in 1723, and principal in 1748. He published anonymously, in London, *An Enquiry into the Life and Writings of Homer* (1735), and *Letters concerning Mythology* (1748). His unfinished *Memoirs of the Court of Augustus* appeared in 3 vols. (1753-64).

Black Witch. A bird. (See ANI.)

Blackwood, JOHN (1818–79), Scottish publisher, was born at Edinburgh, and assumed superintendence of the London branch of the business in 1840; became editor of *Blackwood's Magazine* (1845), and head of the publishing business after 1852. He recognized the first Lord Lytton's genius, and discovered George Eliot, all of whose novels save one were published by him.

Blackwood, WILLIAM (1776–1834), founder of the celebrated Edinburgh publishing house, came of an old Scottish family which has been traced back to the 15th century. One of the family was lord provost of Edinburgh from 1711 to 1713, and, in spite of loss by the Darien speculation, was able to purchase the Fifeshire estate of Pitreavie. From a nephew or a grandnephew of this Blackwood the publisher was descended. He started as an Edinburgh bookseller in 1804. The first number of *Blackwood's Magazine* was issued in April, 1817. William Blackwood undertook the editorship, and gathered round him a staff of distinguished contributors, including Scott, Lockhart, Hogg, Wilson (Christopher North), De Quincey, Galt, Maginn, Thomas Aird, and Dr. Moir (Delta). See Mrs. Oliphant's *Annals of a Publishing House* (1897–8).

Bladder. The bladder is the reservoir for the urine. It is a musculo-membranous sac, situated in the pelvis, behind the pubes and in front of the rectum, in the male; in the female, the uterus and vagina lie between it and that intestine. In infancy it is conical in shape; in the adult, when empty, it is a small triangular sac lying deeply in the pelvis, flattened from before backwards. When slightly distended, it is rounded in shape; when greatly distended, ovoid, and rises from the pelvis into the abdominal cavity. When moderately full, it contains about a pint, but is capable of great distention, and has been known to hold twenty pints. It has three openings into it—those of the two ureters from the kidneys, and that of the urethra. The bladder is composed of four coats, which are, from without inwards, the serous peritoneum, the muscular, the submucous, and the mucous.

Diseases.—Inflammation or cystitis, usually a chronic affection, and in the majority of cases due to the introduction of micro-organisms from without. When the vitality of the mucous membrane of the bladder is lowered and micro-organisms are present, pus is formed, and there is suppurative cystitis. If the urine, though containing bacteria, is free from pus, the condition is catarrhal cystitis. If the irritant is a calculus or stone, or uric acid or oxalate of lime crystals, simple cystitis may occur. Examined with the cystoscope, the mucous membrane of the bladder then appears much congested. Any obstruction to the escape of urine predisposes to cystitis. The treatment of cystitis is to remove the cause and to give urinary antiseptics, such as boric acid, salol, benzoic acid, naphthalin, benzonaphthol, benzoates of soda and ammonia. Absolute rest, hot baths and fomentations, laxatives and bland fluids are all helpful in acute cases, and sometimes opiates are needed. Alcohol must be avoided. Washing out the bladder is an effectual method of treating chronic cystitis. Tubercular disease of the bladder is usually a secondary affection, due to extension of the same condition from the kidneys, prostate, or seminal vesicles. The treatment is mainly constitutional. Ulceration of the bladder may occur in the course of chronic cystitis. Calculus, or stone in the bladder, may occur at any age, and is treated surgically. The nuclei of most calculi form in the kidney and pass down into the bladder, where they increase in size by successive deposits from the urine. Climate and the nature of the drinking water influence their formation. In the bladder, calculi are generally from a half to one and a half inches in diameter, and are mainly phosphatic. They give rise to pain, sudden interruption in the flow of urine, hæmaturia, and frequent intense desire for micturition; they are removed by a crushing operation (lithotrity), or by a cutting operation (lithotomy). Rupture occurs from a blow when the bladder is full; immediate surgical operation gives the best chance of recovery. The bladder is frequently the seat of tumors, such as papilloma, sarcoma, and carcinoma or cancer, which may be removed by surgical operation, but are liable to return.

Bladder Nut. The *Staphyleas*, or bladder-nut trees, are hardy, deciduous shrubs. The best known is *S. colchica*, which is often forced into bloom in early spring. In the open air it blooms in June and July, its white flowers being borne in large terminal racemes. It commonly attains to a height of about four feet. Job's tears (*S. pinnata*) is a much taller-growing species, and its early summer flowers are followed by white nuts with pistachio flavor. *S. trifolia* is another tall species (about 15 feet), blooming in early summer. It is found in open woods, and has drooping flowers, succeeded by much inflated, veiny fruits, which rattle when touched after maturity. *S. Bolander*, of Southern California, blooms later in the year.

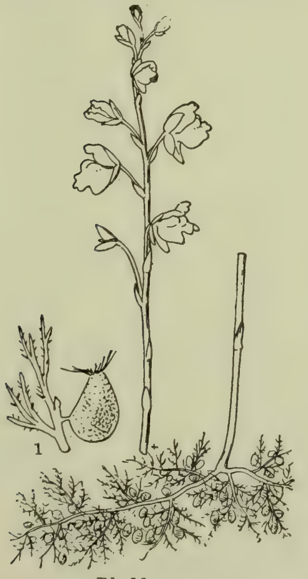
Bladder - plum, or POCKET-PLUM, is a malformation of the fruit of plum, caused by the attacks of a fungus (*Exoascus pruni*), which also occurs in other species of the same genus, such as bird cherry and blackthorn. See M. Ward's *Disease in Plants.*

Bladder Seed (*Physospermum cornubiense*) is an umbelliferous plant with bladder-like fruits. It occurs in the south of France and Spain.

Bladder Senna (*Colutea arborescens*) is a leguminous shrub with yellow flowers. It prefers a dry, sandy soil, and is a native of S. Europe. Its pods are inflated like those of the bladder nut, and its leaves have been used for mixing with true senna.

Bladder - worms, the larval stages of tapeworms; sometimes more dangerous parasites than the adults, owing to the great destruction of tissue which they can produce in such organs as brain, liver, etc. In the case of one of the tapeworms of man, *Tænia solium*, the eggs of the parasite leave the body of the host with the excreta, and are eaten by the omnivorous pig. Within the alimentary canal of the pig the embryos hatch from the shelled eggs, and bore their way into the muscles, where they become encysted and form bladder-worms. A bladder-worm consists of a head or scolex, and a distended bag of fluid, the so-called bladder. If imperfectly-cooked pork containing these bladder-worms is swallowed by man, the bladder-worms lose the bladder, and the head or scolex attaches itself to the wall of the alimentary canal, and grows into a tapeworm. Man may become infected with bladder-worms owing to imperfect cleanliness, and especially to close companionship with dogs whose health is not carefully looked after, for the dog is peculiarly liable to tapeworm. One of the most dangerous bladder-worms found in man is *T. echinococcus*, a common tapeworm in the dog. The bladder-worm of *T. cœnurus*, again, which is also found in the dog, is peculiarly fatal to sheep, producing the disease known as sturdy. Bladder-worms were known in man and the domestic animals before their relation to tapeworms was discovered, and they are therefore sometimes still designated by names which are different from the names applied to the adult forms: *e.g.* the bladder-worm of *T. cœnurus* is called *Cysticercus cerebralis*, and that of *T. solium* receives the name of *C. cellulosæ.*

Bladderwort (*Utricularia*), a genus of water plants which are rootless and grow suspended in the water. The flowers resemble those of snap-dragon, often yellow or purple. The common bladderwort (*U. vulgaris*), which is widely distributed, has a stem the thickness of whipcord, and this is fringed with fine leaves which are repeatedly divided with linear segments. Some of the leaf divisions form intricate bladders, which have an aperture protected by bristles and fitted with a trap-door. Larval crustaceans and other water animals take shelter inside the bladders, but the trap-door prevents their return; they die, and the dissolved substances of their bodies provide the plant with food.



Bladderwort.

1. Bladder, enlarged.

Bladensburg, vil., Maryland, on the East Branch of Potomac R., 5 m. N.E. of Washington. Here, on Aug. 24, 1814, the British defeated the Americans, and as a result captured the town of Washington. Pop. (1910) 460.

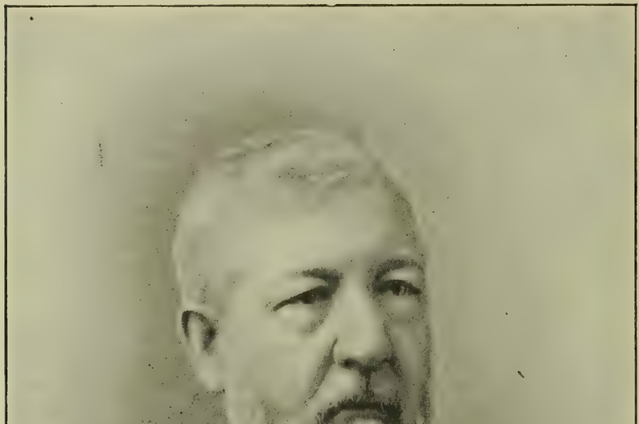
Blaeu, or BLAEUW, JAN, Dutch cartographer, died 1673, author of *Magnum Theatrum Urbium Belgicæ* (1649), *Atlas Magnus* (1650–62), and *Theatrum Civitatum Italiæ* (1663). The *Atlas Magnus* includes 49 maps of Scotland prepared by Timothy Pont. Blaeu's father, WILLEM JANSZOON (1571–1638), pupil of Tycho Brahé, published a map of the heavens, and *Novus Atlas* (1634–62).

Blagodat, mt. (1,260 ft.) on E. slope of Urals, Russia, N.E. of Perm; source of supply (some 50,000 tons annually) of magnetic iron ore worked at Kushvinsk and Goro-Blagodat iron works. Pop. of dis. 50,000.

Blagoveshchensk, the only town in the Amur prov., Asiatic Russia, situated on the Amur near the confluence of the Zeya, at a distance of 823 m. from Khabarovsk. It is the centre of a gold-mining district, and has a ship-building yard.

Blaine, JAMES GILLESPIE (1830–93), an able American political leader, born at West Brownsville, Pa., Jan. 31, 1830. On both his father's and his mother's side he was of Scotch-Irish descent, and he was the grandson of Ephraim Blaine, who had rendered services of great value as Commissary General of Purchases (1780–2) of the Continental Army, during the American Revolution. James graduated with distinction at Washington College, near his home, in 1847, taught in the Western Military Institute, Georgetown, Ky. (1848–51), and in the Pennsylvania Institute for the Blind, at Philadelphia (1852–4) and in 1854 removed to Augusta, Me., the home of his wife, by birth Harriet Stanwood, whom he had married (1850) when she was teaching school at Millersburg, Ky. At Augusta, he, with John L. Stevens, edited (1854–7) the *Kennebec Journal* (Whig), then probably the most influential newspaper in the state, and in 1857–60, still living at Augusta, he edited the *Portland Advertiser*, the leading Republican organ in Maine. Blaine having joined the Republican Party soon after its organization and having been a delegate to the Republican National Convention of 1856. While still a young man, his great ability and his political sagacity made him the most influential Republican leader in Maine; he was a member of the lower house of the state legislature (1859–62) being speaker in 1861 and 1862, and from 1859 until 1881 he was chairman of the Republican State Committee. From 1863 to 1877 he was a member of the National House of Representatives, of which he was speaker in 1869–75, and from 1876 to 1881 he was a member of the U. S. Senate. His services in Congress made him one of the most conspicuous national figures of the time, and in debate he was unsurpassed for brilliance, quickness of repartee, and for ready knowledge of the political history of the country. He strenuously opposed the reconstruction policy of Pres. Johnson, whose impeachment, however, he at first opposed, though later joining his Republican colleagues; he advocated a policy of severity toward the South; he was virtually the author of the Fourteenth Amendment to the Constitution; and he vigorously opposed the greenback movement of 1867–8. As Speaker of the House, he won high praise from both parties, and is recognized as 'one of three or four great occupants of the chair, hardly second to any one' (Stanwood). He opposed the Electoral Commission as unconstitutional. In the Senate his influence was not equal to what it had been in the House, but he was, nevertheless, prominent in debate, and, as regards specific measures, opposed the Bland Silver Coinage Act, advocated ship subsidies, and urged the restriction of Chinese immigration. During his career in Congress, though he won many friends, he also made enemies, chief of whom, on his own side, was Roscoe Conkling, with whom he had his first altercation in 1866; and various charges were brought against him, chiefly to the effect that he had corruptly used his political position for private gain, particularly by accepting improper favors from the Union Pacific and the Little Rock and Fort Smith railroads. The charges were the subject of investigation by a committee of the House of Representatives (1876), culminating in one of the most dramatic episodes in Congressional history—the production of the so-called 'Mulligan

Letters' (q.v.). It is now generally thought that none of the charges, at least in its worst form, was ever conclusively proved against him—at most he seems to have been guilty of a certain degree of impropriety but his position before the country and within his party was greatly weakened by them. In spite, therefore, of his great popularity, due largely to his remarkable personal magnetism, he failed to secure the presidential nomination of his party both in 1876 and in 1880, though in each case his nomination at the outset seemed probable. In March, 1881, he entered Pres. Garfield's cabinet as secretary of state, but remained in office only a few months under Pres. Arthur, resigning in December. In this brief period he attempted to secure a modification of the Clayton-Bulwer Treaty and took steps to summon a Pan-American Congress, a plan that was reversed by his successor. In 1884 he finally was nominated by the Republicans for the presidency, but the charges which had been brought against him and which were now revived led a considerable number of his own party to vote for his Democratic opponent, Grover Cleveland, in whom they had confidence, and Blaine was defeated. From 1889 to 1892 he was again secretary of state (in Pres. Harrison's cabinet), and during this period negotiated with Germany a treaty concerning Samoa, called and presided over the Pan-American Congress, which he had previously planned, engaged in a vigorous discussion with Lord Salisbury concerning the Bering Sea Fisheries, the questions at issue being finally submitted to arbitration, and tried in vain to carry out the reciprocity provisions of the McKinley Act, the succeeding (Democratic) administration reversing the policy. In general his policy was one of 'national expansion, national self-assertion, national participation in world politics;' he was the precursor of the so-called imperialists of 1898 and the following years. Blaine died at Washington soon after leaving office—on Jan. 27, 1893. He published *Twenty Years of Congress, from Lincoln to Garfield* (2 v., 1884–6), a work of great value. The best biography is Stanwood's *James G. Blaine* (1905); see also Gail Hamilton's (Abigail Dodge) *Biography of James G. Blaine* (1895), bearing principally on Blaine's private, rather than on his public life.



James G. Blaine.

Blair, city, Neb., co. seat of Washington co., 25 m. N.N.W. of Omaha, near the Missouri R., on the Chi. and N. W. and other R. Rs. It is the seat of Blair College (Danish). It manufactures wagons and flour. Pop. (1910) 2,584.

Blair, ANDREW GEORGE (1844–1907), Canadian lawyer, was born at Fredericton, N. B., called to the bar in 1866, elected to the New Brunswick assembly in 1878, premier 1883–96, minister of railways and canals in Dominion cabinet 1896–1903, chief of board of railway commissioners 1903–04, then resumed law practice.

Blair, FRANCIS PRESTON (1791–1876), American journalist, was born at Abingdon, Va., and graduated (1811) at Transylvania University, Ky. At first a supporter of Henry Clay politically, he opposed the latter's views in regard to the United States bank, and was invited by Pres. Jackson to establish a paper in the interest of the Democratic Party at Washington. He was editor of the *Globe* from 1830 to his deposition by Pres. Polk in 1845. Mr. Blair was active in support of the Republican party from its foundation until the close of the Civil War, but opposed the party's reconstruction policy and joined forces with the Democracy.

Blair, FRANCIS PRESTON, 2d (1821–75), American lawyer and soldier, son of the preceding, was born in Lexington, Ky., and graduated (1841) at Princeton. He was admitted to the bar of Kentucky, 1843, and practised in St. Louis. He served as a private in the Mexican War, and for several terms in the Missouri legislature, and joined the Republican party, 1856, by which he was elected to Congress. He was again elected in 1860 and 1862. By his prompt action, in the early days of the Civil War, in preventing the seizure of the St. Louis arsenal by state troops, it is thought that Mr. Blair preserved Missouri and Kentucky to the Union. He served in the Union army during the Civil War, rising to the rank of major-general of volunteers. After the war he opposed the reconstruction policy of the Republicans, affiliated with the Democratic party, and was its unsuccessful candidate for the vice-presidency in 1868. General Blair was U. S. senator from Missouri, 1871–3. Author of *The Life and Public Services of Gen. William O. Butler* (1848).

Blair, Henry William (1834), American senator, was born at Campton, N. H., educated himself, and was admitted to the New Hampshire bar, 1859. He served through the Civil War, was elected to his state legislature, and was a member of Congress from N. H., 1875–9. He was then elected to the U. S. senate, and reëlected in 1885, and was again a member of Congress, 1893–5. Senator Blair was an advocate of national aid to state education, and was active in temperance and woman suffrage movements. He took much interest in pension matters, and drew up many of the bills granting pensions to soldiers. Senator Blair resumed the practice of the law at Washington after retiring from politics.

Blair, Hugh (1718–1800), Scottish divine and author, born in Edinburgh, and became minister successively of Collessie, Fifeshire (1742); Canongate Church, Edinburgh (1743); Lady Yester's Church (1754) and the High Church (1758). In 1759 he began a course of lectures on rhetoric under the auspices of Edinburgh University, and these were so popular that a professorship was founded, to which he was appointed in 1762. His *Lectures on Rhetoric and Belles Lettres* were subsequently issued in 2 vols. (1783). He was much admired as a preacher, and his *Sermons*, published at various times from 1777 onwards, the first volume mainly by the influence of Dr. Johnson, procured him (1780) a pension of $1,000 from George III. He wrote, besides, *A Critical Dissertation on the Poems of Ossian* (1763). A Life by J Finlayson is prefixed to the fifth volume of his *Sermons* (1801).

Blair, James (1656–1743), American colonial preacher and educator, born in Scotland. He graduated at Edinburgh University (1673), was an Anglican rector near Edinburgh for several years, and in 1685 went to Virginia, where from 1689–1743 he was Commissary for the Bishop of London, the highest position in the colonial church. After 1693 he was a member, and for much of the time was president, of the Colonial Council, and altogether was one of the most influential men in the colony. He is remembered, however, chiefly as the virtual founder, and as the president from 1693 until his death, of the College of William and Mary. He published *Our Saviour's Divine Sermon on the Mount* (4 v., 1722), and, with Hartwell and Chilton, *The Present State of Virginia and the College* (1727), a valuable account of colonial Virginia. See Motley, *Life of Commissary James Blair* (1901).

Blair, John Insley (1802–99), American capitalist, was born in Warren co., N. J., worked in the country store of a relative until 1819, and established a similar store of his own at Blairstown, N. J., 1821. His business expanded to an extraordinary extent; he became interested in iron mines and railroads, and he had a large share in building the railroad properties which were consolidated as the Delaware, Lackawanna and Western railroad in 1852. He engaged extensively in railroad building in the West and Southwest, being one of the original directors of the Union Pacific railroad. Mr. Blair gave largely to Presbyterian educational institutions and helped to build many churches along the lines of his railroads.

Blair, Montgomery (1813–83), American politician, was born in Franklin co., Ky., and graduated (1835) at West Point. He resigned after serving in the Seminole War, and practised law in St. Louis. After serving as U. S. district attorney for Missouri, he was judge of the Court of Common Pleas, 1843–9. Mr. Blair removed to Maryland, 1852, and severed relations with the Democratic party on the repeal of the Missouri Compromise. He was counsel for the defendant in the Dred Scott case, was postmaster-general under Lincoln, 1861–4, and brought about numerous innovations in the postal service. His retirement was due to differences with the administration, and he thereafter supported the Democratic party.

Blair, Robert (1699–1746), Scottish divine and poet, was born in Edinburgh. Was in 1731 presented to the living of Athelstaneford, E. Lothian, where he remained till his death. His well-known poem, *The Grave*, although of unequal merit, rises in places to a dignity almost Shakespearian. For his life see Dr. William Anderson's edition of *The Grave*.

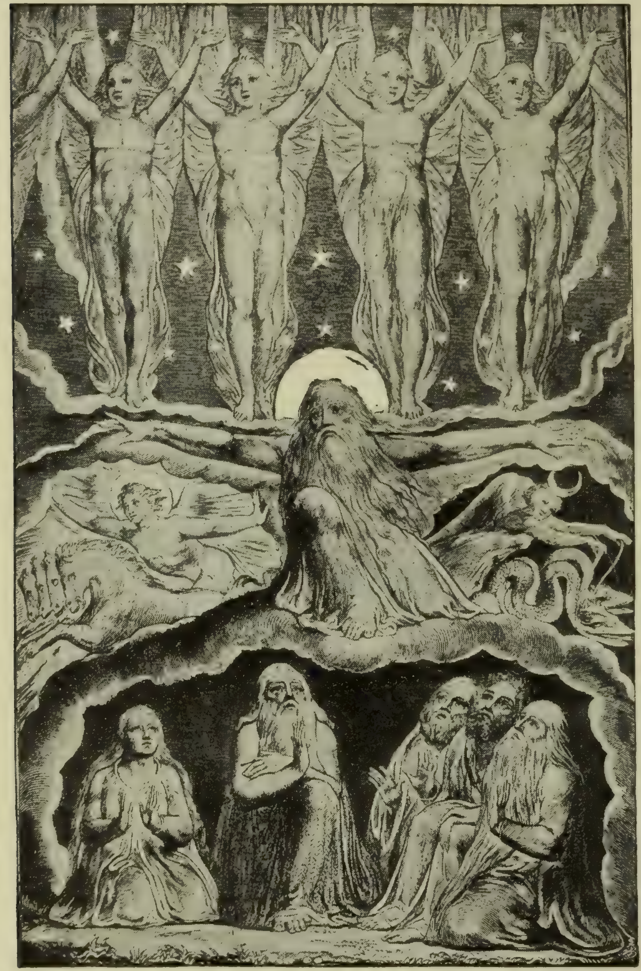
Blairsville, bor., Indiana co., Pa., 40 m. E. of Pittsburg, on the Conemaugh R., and on the Pa. R. R. and the Pa. Canal. Its manufactures are glass, coke, flour, etc. Pop. (1910) 3,572.

Blake, Edward (1833-1912), Canadian statesman, born in Middlesex co., Ontario, and graduated at the University of Toronto. He was admitted to the bar in 1856, and served as a Liberal in the Ontario Assembly, becoming first Liberal premier in 1871 and resigning his seat in 1872. He held a position in the federal cabinet of Hon. A. MacKenzie in 1873–4, was minister of justice, 1875–7, and president of the Council, 1877–8, resigning all these positions in turn. After further service as member of the Dominion parliament and leader of the Liberal party he retired from Canadian public life in 1892. During 1892–1909 he sat in the British Parliament as Nationalist member for South Longford, Ireland. In 1907 he retired from public life.

Blake, Francis (1850), American inventor, was born at Needham, Mass., and received a high-school education. He entered the United States coast survey, in which he served for thirteen years. Resigning, he devoted himself to experimental physics, and invented the telephone transmitter known by his name in 1878. He patented many other electrical contrivances, and was associated with the progress of telephony.

Blake, Lillie Devereux (1835), American reformer, was born at Raleigh, N. C., the daughter of George P. Devereux of that place. She was twice married, the second time to Grinfill Blake, of New York. Her interest in woman suffrage dated from 1869. She was a member of the delegation that presented the woman's declaration of rights in Philadelphia, 1876, was for many years president of the N. Y. State Woman Suffrage Association, and was a founder and president of the National Legislative League from 1900. Author of *Woman's Place To-day* (1883), and several works of fiction.

Blake, Robert (1598–1657), English admiral, was born at Bridgwater, Somersetshire, and was engaged in commercial pursuits until the civil war. He sat for Bridgwater in the Short Parliament of 1640. Joining the Parliamentary forces, he became colonel, distinguished himself at the defence of Bristol (1643), held Lyme against the royalists (1643–44), and captured and defended Taunton (1644–5). In 1649, after unsuccessfully blockading Prince Rupert at Kinsale, Blake, in conjunction with two other officers, Deane and Popham, was appointed to command the fleet, and in the following year destroyed most of Prince Rupert's squadron at Malaga, in the south of Spain. In 1651 he captured the Scilly Isles and Jersey from the royalists. In 1652, being appointed to the chief command of the fleet against the Dutch, he, assisted by Rear-admiral Bourne, defeated Van Tromp in the Downs, and then De Witt and De Ruyter off the mouth of the Thames, but himself sustained a reverse at the hands of Tromp off Dungeness. In the following year, after fighting, in conjunction with Deane, Monck, and Penn, an indecisive action with Tromp off Portsmouth, Blake met the same antagonist once more off the Dutch coast, and finally routed him, Tromp being killed in the action. On his return to England he was summoned to Parliament by Cromwell, and after a period of peace was sent in 1655 with an expedition to teach a lesson to the pirates of Tripoli, Algiers, and Tunis. This he successfully accomplished. In 1656, when war broke out with Spain, Blake took charge of the blockading squadron off Cadiz; but hearing of the presence of a Spanish treasure fleet at Teneriffe, he sailed thither, and finding a naval force at Santa Cruz strongly protected by shore batteries, sank or burnt the former and silenced the latter. Blake then returned to his station off Cadiz; but failing health compelled his return to England, and he died on Aug. 17, 1657, on board his flagship the *George*, within sight of Plymouth Sound. He was buried in Westminster Abbey, but after the restoration his body was shamelessly dug up and flung into a hole in the churchyard of St. Margaret. Blake was supremely honest, brave, patriotic, and self-sacrificing, and ranks high among the very greatest of Englishmen. See Hepworth Dixon's *Robert Blake* (1852); a *Life* by Dr. Samuel Johnson (1777); D. Hannay's *Life of Blake* (1886); *The First Dutch War* (Navy Records Society, 1899–1900).



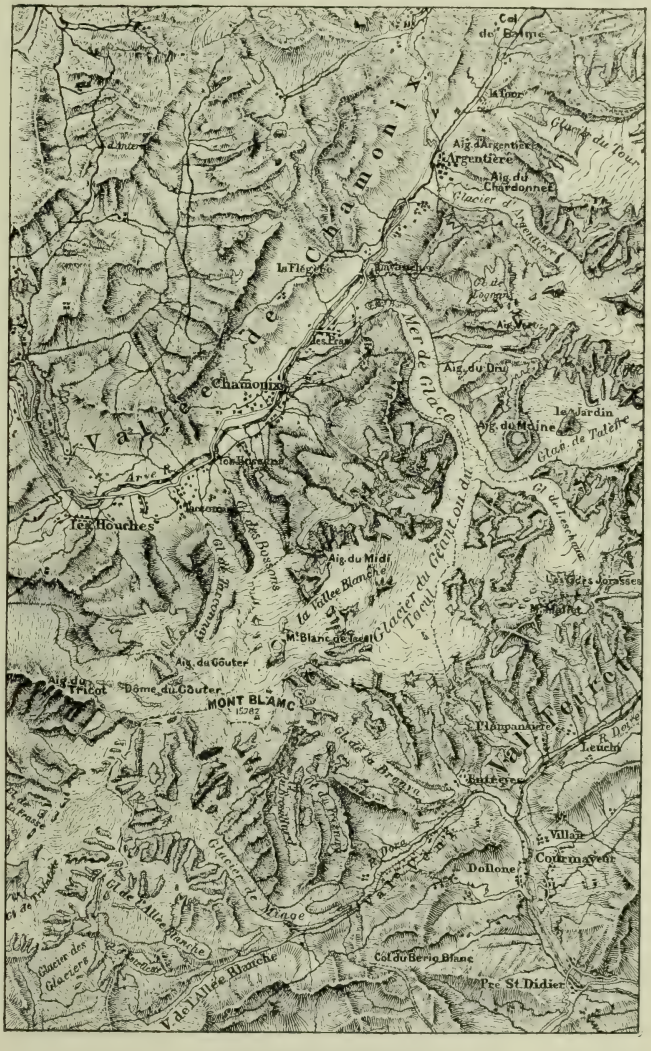
Engraving by Blake: 'The morning stars sang together' (*Job* 38:7).

Blake, WILLIAM (1757–1827), English mystic, poet, painter, and engraver, was born in London, the son of a hosier whose real patronymic is said to have been O'Neil. From the age of four to the end of his life Blake had times of exaltation, when he saw visions—a real or fancied prophetic power which affected all his future work. In 1784–87 he had a printsellers' shop; but engraving was the practical business of his life. As painter and as poet Blake has been idolized and he has been reviled. His works, however, show him to be a true poet, a seer as well as a visionary, instinct with melody, and yet often as indifferent as his disciple Walt Whitman to the music of verse. As a draughtsman and a designer he was full of masterly power; nevertheless his Wiertz-like conceptions and barbaric coloring seem at times the inspirations of sheer frenzy. After a long life of toil and neglect, Blake died in London, where he had mostly lived. His greatest works were the *Songs of Innocence* (1789) and *Songs of Experience* (1794), and the 'prophetic' series—*Thel* (1789), *The Marriage of Heaven and Hell* (1790), *The Gates of Paradise* (1793), *The Vision of the Daughters of Albion*, and *America* (1793), *Europe* and *The Book of Urizen* (1794), *The Song of Los* and *The Book of Ahaniah* (1795); and his many pictorial designs and engravings (dissociated from his poetry), of which the most notable were his illustrations to the Book of Job (1826), Young's *Night Thoughts* (1777), and Blair's *The Grave* (1804–5). W. Rossetti's edition of his *Poems* (1857) in the Aldine series contains his best poetic work. See his *Life*, by A. Gilchrist (1863 and 1880); *William Blake*, by A. C. Swinburne (1868); *Works*, very fully analyzed by E. J. Ellis and W. B. Yeats (1893); and Dr. Garnett's *William Blake* (1895). *The Inventions to the Book of Job* have been reproduced by heliotypy by James Osgood of Boston.

Blakely, JOHNSTON (1781–1814), American naval officer, was born near Seaford, Co. Down, Ireland, and was brought to Wilmington, N. C., when two years old. His father's death obliged him to abandon his course at the University of North Carolina, and he entered the navy as midshipman in 1800. Blakely commanded the *Wasp* in the War of 1812, and received a gold medal from Congress for his capture of the British brig *Reindeer* in May, 1814. After taking several other prizes Blakely and the *Wasp* disappeared in October of the same year, and the vessel is presumed to have foundered.

Blanc, MONT, the loftiest mountain (15,782 ft.) in the entire chain of the Alps. It rises towards the S.W. end of the chain to which it gives its name, to the S. of Chamonix (France) and to the N.W. of Courmayeur (Italy). By the treaty ceding Savoy to France in 1861 it was agreed that the highest summit should become wholly French. It was originally named simply Les Glacières, or the Montagne Maudite, the first certain occurrence of the name Mont Blanc being found in an Italian document of 1694. Great glaciers stream from it on all sides, the Italian slope being by far the steepest and grandest. It was first ascended in 1786 by two Chamonix men—Dr. Paccard and Jacques Balmat. The third ascent (1787) was made by the famous Genevese naturalist, H. B. de Saussaure (statue at Chamonix), and a week later the first Englishman, Colonel Beaufoy, achieved the ascent. Now the ascent is frequently made in summer from Chamonix by way of the Grands Mulets (inn) and the Bosses du Dromadaire (shelter hut), the easiest route. The first winter ascent was made by Miss Isabella Straton in January, 1876. Plans have been completed (1909) for a railway connecting Chamonix and Aosta through a tunnel of 8½ m. under Mont Blanc. See Charles Durier's *Le Mont Blanc* (1st ed. 1877; 4th ed. 1897); Charles E. Mathews's *The Annals of Mont Blanc* (1898); P. Güssfeldt's *Der Mont Blanc* (1894)—also in French. The best map (scale 1–50,000) is that by Imfeld and L. Kurz, published in 1896.

THE CHAIN OF MONT BLANC stretches from the Col de Balme (7,221 ft.), on the N.E., to the Col du Bonhomme (8,147 ft.) and the Col de la Seigne (8,242 ft.), on the S.W. and is mainly divided between Italy and France. The chief passes (all glacier) are the Col de la Brenva (14,217 ft.), the Col d'Argentière (11,536 ft.), the Col de Miage (11,077 ft.), the Col du Géant (11,060 ft.), and the Col du Tour (10,762 ft.). See L. Kurz's *Guide de la Chaîne du Mont Blanc* (1892; and in English, same date), and his *Carte de la Chaîne du Mont Blanc* (1896).



Chain of Mont Blanc.

Blanc, JEAN JOSEPH LOUIS (1811–82), French historian and revolutionist, was born at Madrid, his father, a Frenchman, being in the service of King Joseph. He was educated at Paris, where in 1839 he founded the *Revue de Progrès*, printing in it his important work on socialism, the *Organisation du Travail.* This treatise, which attracted wide attention, was the first exhaustive manifesto of state socialism as opposed to individualism. About this time Blanc was the victim of a murderous attack, of which his brother had a distinct presentiment, and which suggested to Dumas the plot of the *Corsican Brothers.* A pamphlet on *Idées Napoléoniennes* was succeeded in 1841 by Blanc's *Historie de Dix Ans* 1831–40, which created an immense sensation, and by its revelations shook the throne of Louis Philippe. In 1847 appeared the first two volumes of his *Histoire de la Révolution Française.* Upon the revolution in 1848, Blanc was elected a member of the provisional government. He enjoyed great popularity with the working-classes, and in March, 1848, a procession of 200,000 workmen, organized by Blanqué, offered him the dictatorship,

MONT BLANC FROM SALLANCHES.

which he refused. But his colleagues and the wealthy men of Paris were jealous of his power; and he further suffered considerable obloquy by reason of the lamentable failure of his scheme to institute national workshops. He was falsely charged with complicity in the disturbances of May, June, and August; and being condemned by a large majority, he sought refuge in Britain, where he remained for upwards of twenty years. He was now chiefly engaged on his *Histoire de la Révolution Française* (completed in 1862), his *Histoire de la Révolution de* 1848 (1870), and his correspondence to the *Temps*, collected and published as *Dix Années de l'Histoire d'Angleterre* (1879–81). Returning to Paris on the downfall of the empire, he afterward opposed Thiers, and denounced the conclusion of peace with loss of territory. Until his death at Cannes, in 1882, he was a deputy for Paris. Blanc was a sincere political idealist, an eloquent advocate of toleration, and personally a man of estimable character. See Edmund's *Louis Blanc, Celebrities of the Century* (1882), and the *Annual Register* for 1882.

Blanca Peak, mt. in Col., 10 m. N. of Fort Garland. It occupies an isolated position, and is one of the most magnificent of the Park Range, and with an altitude of 14,464 ft. is the next highest mt. in the U. S. to Mt. Whitney.

Blanchard, SAMUEL LAMAN (1804–45), English author and editor, was born at Great Yarmouth. In 1828 he published his *Lyric Offerings*, with a dedication to Charles Lamb. After his death Bulwer-Lytton collected his prose essays, under the title of *Sketches of Life* (3 vols. 1846), and Blanchard Jerrold did the same for his poetical works (1876). Most of Blanchard's work as an editor was connected with the *True Sun* and the *Courier*. See Memoir in *Sketches from Life*.

Blanche, DENT, one of the grandest peaks (14,318 ft.) of the Alps, near Zermatt, to the W. of which it rises, nearly opposite and N. of the slightly higher Matterhorn. This difficult climb was first made in 1862, by T. S. Kennedy and W. Wigram.

Blanching Vegetables. By the exclusion of light certain changes take place in the metabolism of plants. This fact is made use of by the gardener in growing certain vegetables which under normal conditions are tough, bitter, and harmful, yet when etiolated or blanched are tender and pleasant. Among the plants treated in this way are celery, seakale, lettuce, cardoons, and endive. In gardens, seakale may be blanched by placing over each crown when the stalks are 6–8 inches above ground a mound of sand, or, if this is not obtainable, a six-inch flower-pot or drain-pipe, the open end being well covered and the lower end pressed well into the soil. Celery is commonly blanched by successive earthings up, care being taken not to bury the summit of the leaves. Two long boards, with one edge of each resting along the ground, the other meeting its fellow just below the crowns of the plants, are also sometimes used. Cos lettuces are usually tied up with pieces of bast, so that the outer leaves serve to exclude light from the hearts; and a similar method is often adopted with endive.

Blanco, CAPE, on the W. coast of Africa, at the W. extremity of the Sahara.

Blanco y Arenas, RAMON, MARQUIS DE PENA PLATA (1832–1906), Spanish official, born in San Sebastian, Spain, entered the army in 1855, became governor of Mindanao, Philippine Ids., succeeded Gen. Weyler in command in Cuba, was captain-general there during the Spanish-American war, and returned to Spain before the American occupation.

Bland, RICHARD PARKS (1835–99), American legislator, was born near Hartford, Ky., educated himself, studied law, emigrated to the West, and in 1860 was already treasurer of Carson co., Nev. He returned to Missouri after the war, and from 1873 to his death was a member of Congress from that state. He is best remembered for his championship of silver which culminated in the 'Bland bill,' 1878, which provided for the purchase of silver sufficient for the coinage of $2,000,000 a month in silver dollars which should be legal tender. See Byars's *Life* (1900). See BIMETALLISM and FREE SILVER.

Bland, THEODORIC (1742–90), American patriot, was born in Prince George co., Va., and studied medicine in Edinburgh, Scotland, returning to America about 1764. He practised his profession up to the outbreak of the Revolution, in which he performed high services, calling forth the praise of General Washington. He was a member of the Continental Congress, 1780–3, opposed the constitution in the Virginia convention of 1788, and was elected that year to the first congress of the United States. See the *Bland Papers*, edited by C. Campbell (1840).

Blankenberge, seaside resort of Belgium, prov. W. Flanders, 9 m. N.W. of Bruges and 13 m. N.E. of Ostend; has quite recently developed out of a fishing village into a popular summer resort visited by nearly 30,000 persons annually. Pop. (1900) 5,048.

Blankenburg. (1.) Town of the German duchy of Brunswick, on the N. edge of the Harz Mts., 12 m. S.W. of Halberstadt; is a favorite summer resort, has a ducal castle, and grows fruit and vegetables. It stands amidst the fantastic sandstone region of the Teufelsmauer and of Regenstein. Pop. (1900) 10,173. (2.) Town in the principality of Schwarzburg-Rudolstadt, Germany, at the N. foot of the Thüringer Wald, 27 m. S.W. of Jena. Here Froebel opened his first kindergarten school in 1840. Pop. (1900) 2,805.

Blanket, a covering for a bed or the bodies of men and animals. The best blankets are wholly composed of wool. Their manufacture is similar to that of other woollen goods, but the soft fluffy matting on the surface is obtained by a process called 'teaseling,' scratching it with teaseling-cards or brushes made of wire. In large manufactories this operation is performed by a machine with a cylinder bristling with teasels, which is made to revolve rapidly while the cloth is drawn over it. With inferior qualities of blankets varying amounts of cotton are used, this material being quite widely employed for the filling. The manufacture of blankets in the U. S. became an important industry after the Civil War, when the fine grades of wool produced in the far West were available for the manufacture. In the East there are numerous factories making grades of blankets at prices ranging from $2 to $20 or more. The American Indians of certain tribes, such as the Navahos and Chilkoots, weave blankets with interesting patterns, which are both warm and valuable for decorative purposes.

Blank Verse, a term which signifies, etymologically, all verse in which the rhymes are 'blank' or lacking, but which is generally restricted in ordinary usage to the unrhymed iambic decasyllable, the common medium in English of narrative and dramatic poetry. This measure was first used in our language, in the translation of the second and fourth books of the *Æneid*, by the Earl of Surrey (1516–47), and was almost certainly copied from the *versi sciolti*, or unrhymed verse of eleven syllables of the Italians—Surrey's immediate example being probably F. M. Molza's translation of Virgil, published in Venice (1541). Surrey's metre was used by Nicholas Grimald in two pieces published in Tottel's *Miscellany* (1557), which, while worthless as poetry, show a curious anticipation of some of Milton's most characteristic rhythms. It was again used by Gascoigne in his satire *The Steele Glas* (1576), but was not employed in any other considerable non-dramatic work until the publication of Milton's *Paradise Lost* in 1667. As a vehicle of dramatic expression it was first used in Sackville and Norton's *Gorboduc* (1561), and continued in 'scholarly' dramas such as Gascoigne's *Jocasta* (1566) and Thomas Hughes's *Misfortunes of Arthur* (1587; new ed. 1874); until, being adopted by Marlowe in his tragedy *Tamburlaine* (1587), it attained such an immediate popular success that dramatists like Peele and Greene, who had previously been writing in rhymed verse, were forced to abandon their own medium and to employ the new measure. Except for a brief period after the restoration, when the couplet and the 'heroic' play reigned supreme, its position as the only suitable dramatic verse has never been disputed; and even Dryden himself, the high priest of the heroic school, reverted to blank verse in his later plays, confessing himself 'grown weary of his long-loved mistress, rhyme.' The special adaptability of the measure for dramatic purposes is generally attributed to the fact that it approaches nearer the language of ordinary speech than any other English form of verse. But this is simply to place the emphasis at the wrong end of the scale; and, as a matter of fact, the measure holds its position principally because the absence of rhyme frees the poet from the necessity, inherent in all forms of rhymed verse, of occasionally inserting lines and phrases merely for the sake of securing metrical balance, and thus leaves him at liberty to employ only the words absolutely necessary for expressing his thought, and to follow without hindrance the most abrupt transitions of passionate feeling. Moreover, the obvious artificiality of rhyme requires the maintenance of a certain height of poetic feeling in order to justify its presence; while blank verse, depending as it generally does for its music on subtle modifications of pause and emphasis, raises no expectations of regularity of movement in the hearer's mind, and may be applied with equal suitability to the loftiest or to the humblest themes. The extreme flexibility of the medium is shown at a glance by the widely varied effects it has produced in the hands of individual dramatists. Nothing can be more unlike than the rhythm of Marlowe—regular, grandiose, and slightly monotonous—and the tripping, unrestrained, and rather undignified movement of Fletcher. In the matter of metrical development these two poets exercised a preponderating influence on Shakespeare, who in his own person summarizes the history of dramatic blank verse. Shakespeare's earliest manner (after he has once got rid of his fondness for rhyme) is very similar to that of Marlowe. The end of each line is strongly marked, and usually coincides with a grammatical pause; double (or 'feminine') endings are comparatively infrequent; and there is a tendency—more strongly marked, however, in Marlowe—to adapt the blank verse to something resembling the older stanzaic arrangement. In his middle manner, as represented by the *Merchant of Venice*, there is a steady decrease in the number of lines which close with a grammatical pause, the sense is more frequently carried forward from one line to another, and double endings become more common, amounting in this case to some 15 per cent. of the whole. His final manner, of which the *Tempest* may be taken as the type, shows a metrical system largely assimilated to that of Fletcher, a proportion of double endings amounting to 33 per cent. of the whole, the sense carried on into the next line in about a third of the total; while nearly 5 per cent. of his lines have 'weak' or 'light' endings—*i.e.* endings such as 'his,' 'for,' 'and'—on which the reader can scarcely make any pause.

Dramatic blank verse had quite ceased to be written when Milton produced the first original example of narrative blank verse in his epic of *Paradise Lost* (1667). To the second edition of this work Milton, at the request of his publisher, prefixed a brief preface, in which he defended his use of the measure, and pronounced rhyme 'no necessary adjunct or true ornament of poem or good verse, in longer works especially, but the invention of a barbarous age to set off wretched matter and lame metre.' By this declaration Milton links himself with such renaissance scholars as Ascham, who had declaimed against rhyme (see *Schoolmaster*, ed. Mayor, p. 176). But Milton was very far from sharing the scholarly objection to the whole recognized system of accentual verse, as his reference to 'lame metre' would alone suffice to show; and in his preface he goes on to define the chief beauty of verse as lying in 'apt numbers, fit quantity of syllables, the sense variously drawn out from one verse into another.' In other words, he clearly perceived that rhyme was only one method of procuring the measure effect essential to poetry, and that, for narrative poetry at all events, a greater effect, combined with greater ease of manipulation, could be produced by deliberate variations of cadence alone. This discovery of the poetical value of a studiously varied cæsura is of first-rate importance in the history of English prosody; and whatever may be thought of the actual originality of Milton's verse, it can scarcely be denied that he was the first to observe clearly the scientific basis on which the harmonies of blank verse depend. For the rest, his metrical excellences are the result of admirable poetic criticism, and wise selection of devices already exemplified by the dramatists, rather than of actual invention. He availed himself to the full of the dramatic liberty of trochaic, spondaic, and anapæstic substitutions for the normal iambs of the verse, and did not hesitate to employ the most daring of Shakespeare's metrical licenses—*viz.* following an overflow line by a line containing a cæsura after the first syllable. In the matter of double endings he seems to have made a distinction between epic and dramatic verse, using them more freely in the latter than in the former; while his fondness for the device increased with his years. In *Paradise Lost* the double endings amount to between 1 per cent. and 2 per cent. of the whole, and in *Paradise Regained* to between 3 per cent. and 4 per cent. On the other hand, *Comus* and *Samson Agonistes* contain 9 per cent. and 16 per cent. respectively. The double endings that occur in the epics, moreover, are more numerous in the speeches and debates than in the purely narrative parts. Where, however, Milton can best claim an absolute originality is in the paragraph form into which he threw his verse. Without this arrangement blank verse becomes monotonous beyond measure, and it is the absence of such division that makes a great part of Wordsworth so hard to read.

Milton's blank verse was received with little favor by his own generation, his most considerable follower being Lord Roscommon, who published a paraphrase of Horace's *Art of Poetry* in 1684. The blank verse of Lee the dramatist shows also a strong Miltonic influence; and John Philips (1676–1708) wrote a clever and not ill-natured imitation of his manner in his *Splendid Shilling* (new ed. 1808). The measure languished even more while the influence of Pope prevailed, but it revived in Young's *Night Thoughts* (1742) and Thomson's *Seasons* (1726–30), and was continued in Akenside's *Pleasures of the Imagination* (1744) and Cowper's *Task* (1785) into the period of romantic revival proper. The gloomy but powerful *Grave* (1743) of Robert Blair is Shakespearean rather than Miltonic in versification, and abounds in double endings. There are few of the 19th century poets who have not employed blank verse in some of their compositions; but while they may have widened its range of application—as Wordsworth, for example, in his *Lines on Revisiting the Wye* applied it to meditative lyric, or as Tennyson in his *Tears, Idle Tears* applied it to the lyric of pure emotion—none of them have innovated to any marked degree in the technique of the metre, and the verse remains substantially the old Miltonic blank verse. Meanwhile, in the dramas that continue to be written, British poets have reverted to the versification of the minor Elizabethans, as one may find exemplified in the influence of Ford on Shelley's *Cenci*, or of Webster on Mr. Swinburne's *Rosamund* (1899). Consult J. Addington Symond's *Blank Verse;* J. B. Mayor's *Chapters on English Metre;* Guest's *English Rhythms* (ed. Skeat).

Blanqui, blän-kē′, JÉROME ADOLPHE (1798–1854), French political economist, was born in Nice. He studied in Paris under J. B. Say, and in 1830 became director of the School of Commerce, three years later succeeding Say in the chair of political economy at the Conservatory of the Arts and Crafts. From 1846 to 1848 he was a member of the Chamber of Deputies. His chief work is *Histoire de l'Economie Politique en Europe*, first published in 1838.

Blanqui, LOUIS AUGUSTE (1805–81), French revolutionist, was born near Nice. He was imprisoned for the illegal manufacture of gunpowder in 1837, and, in 1839, was condemned to death for his activity in organizing extreme revolutionary societies, the sentence, however, being commuted to imprisonment for life. Released by the revolution of 1848, he became the leader of the extreme socialistic party and for his communistic tendencies was sentenced to ten years' imprisonment. He was released in 1859, but was again sentenced two years later to four years. On the downfall of the empire (1870) he resumed his revolutionary propaganda, until arrested by order of Thiers. He was brought to trial in 1872, and was imprisoned at Clairvaux, but was once more released in 1879. The same year he was returned for a division of Bordeaux, but the election was annulled. He is the author of *L'éternité dans les astres* (1872); his political writings were published under the title *Critique Sociale.* Consult Combes' *Portraits Révolutionnaires;* Geffroy's *L'Enfermé;* Da Costa's *Les Blanquistes.*

Blantyre, blan-tīr′, town, chief commercial centre of Nyasaland, Africa; 41 miles southwest of Zomba. It has a Chamber of Commerce, an Anglican Church, Blantyre Church (Church of Scotland), and a White Fathers' Mission. The chief exports are cotton, coffee, fibre, rubber, tobacco and tea. Blantyre was founded in 1876, being named for Livingstone's native town in Scotland. Pop. (white) about 250.

Blantyre, parish and town, Lanarkshire county, Scotland; 3 miles northwest of Hamilton. The town, which is known as High Blantyre, has coal and iron mines. The village, known as Blantyre Works, is the centre of an extensive colliery district, and is the birthplace of Livingstone, the African explorer. Pop. (parish, 1921) 18,153.

Blar′ney, village, county of Cork, Ireland; 4 miles northwest of Cork. It contains an old castle, which occupies the site of a still older stronghold erected in 1446 by Cormac M'Carthy. The famous Blarney stone, built into the castle some twenty feet from the top, is supposed to confer wonderful powers of persuasion upon those who kiss it.

Blasco Ibañez, bläs′kō ē-bä′-nyàth, VICENTE (1867–), Spanish novelist, was born of Aragonese parents. He was destined for the legal profession but soon abandoned it as uncongenial to his revolutionary spirit. He was frequently imprisoned in his youth for political offences, became leader of the Republican party in Spain, representing a radical constituency in the Cortes, and undertook the editorship of a revolutionary journal *El Pueblo.* His writings reflect his militant zeal in behalf of justice and brotherhood. They include *The Shadow of the Cathedral, Arroz y Tartana, The Argonauts, The Four Horsemen of the Apocalypse, Mare Nostrum, Blood and Sand, The Intruder, The Horde, Woman Triumphant, The Enemies of Woman, Sonnica, The Fruit of the Vine, The Cabin, The Mayflower.*

Died Jan 28, 1928.

Blash′field, EDWIN HOWLAND (1848–), American painter, was born in New York City, and studied in Paris under Bonnat and Gérôme, and at the Royal Academy, London. On his return to the United States (1881), he became known for his mural work, examples of which may be seen on the great central dome of the library of Congress, in the Minnesota, Iowa, Wisconsin, and South Dakota State capitols, in the court houses of Baltimore, Newark, N. J., and Youngstown, Ohio, in the New York Appellate Court, the chapel of the College of the City of New York, and in a number of private houses. He is a member of the National Institute of Arts and Letters, and was its president, 1915–16. Among his canvases are *The Angel with the Flaming Sword* and *Christmas Bells.* He wrote, in conjunction with his wife, *Italian Cities* (1900), and an English edition of Vasari's *Lives of the Painters* (1897).

Blasius, blā′zi-us, ST., bishop of Sebaste, Cappadocia, martyred by Agricola in 316. He was considered a guardian saint against throat diseases, for relief from which his blessing is still invoked on his day (Feb. 3). The stories of his life and works are purely legendary.

Blas′phemy, in English and American law, the criminal offence of maliciously and publicly contemning God, Christ, the Bible or the Christian religion. Although formerly denial of the accepted doctrines of Christianity was punishable as blasphemy, the offence to-day comprises only those expressions designed to wound the feelings of mankind, to excite contempt and hatred against religion or the church, or to promote immorality. Even in this restricted form, blasphemy is seldom punished, unless it results in public disturbance or a breach of the peace. In some of the United States blasphemy is no longer punishable as a separate offence.

Blass, bläs, FRIEDRICH (1843–1907), German classical scholar, was born in Osnabrück, Hanover. He studied at Göttingen and Bonn, taught in the University of Königsburg, and was professor of classical philology at Kiel (1876–92). In 1892 he became professor of philology at Halle, which position he retained until his death. He published or revised the text of all the important Greek orators. His other works include *Die Attische Beredsamkeit* (3 vols. 1868–80; new ed. 1887–92); *Die Griechische Beredsamkeit in dem Zeitraum von Alexander bis auf Augustus* (1865); *The Republic of the Athenians* (1892); *Philology of the Gospels* (1898); *Bacchylidis Carmina* (1904).

Blasting, the method of shattering masses of solid matter by means of explosives. Before the discovery or invention of gunpowder early in the fourteenth century, two methods of quarrying or of extracting minerals were employed: splitting the stone by means of a hammer, chisel, or wedge; and the breaking up of solid rock by the expansive power of heat. Gunpowder was first adapted to mining in Germany about 1613 and was introduced into England toward the end of that century. Invention of new methods of blasting proceeded slowly, and not until 1846 were the high explosives, such as guncotton and nitroglycerin, discovered. Blasting is now widely adapted to such operations as mining and quarrying (qq. v.) and tunnelling (see TUNNELS AND TUNNELLING).

The principal explosives in ordinary use are black powder; dynamite; blasting gelatin, composed of guncotton and nitrostarch dissolved in nitro-glycerin; trojan powder; rackarock; and mercury fulminate, an extremely sensitive and dangerous compound made by dissolving mercury in nitric acid and immersing this solution in common alcohol. (See EXPLOSIVES.)

Three methods of blasting are practicable: (1) the small-shot system; (2) the mine system; (3) surface blasts. In the small-shot system holes of small diameter are bored deep into the solid rock; the charge is placed deep in the holes, which are tamped or closed with sand or clay; and the blast is fired by use of a time-fuse.

Large blasts or mines are resorted to when great masses of rock must be removed, or when a great supply of irregularly broken stone is required. Such mines are of two kinds: shafts sunk from the top of the rock; and headings or galleries driven in from the face. In a shaft mine the charge of powder is placed in a chamber cut at one side of the shaft, so that the tamping may not be in the direct line of fire, the charge being usually exploded by electricity.

Surface blasts are produced by firing the explosive in contact with or near the substance to be shattered. When fired with a detonator, such compounds as nitro-glycerin and guncotton operate downward, producing great shattering effects.

Blasting Gelatin. See BLASTING.

Blas'toids, a class of Echinodermata comprising small calcareous fossils occurring, for the most part, in the Carboniferous limestone. Blastoids are characterized by the presence of the hydrospires — five convoluted calcareous tubes communicating with the exterior and carrying a current of water to aërate the blood. The commonest genus is the pentremites (q. v.).

Blastomycosis, a suppurative and granulomatous process affecting chiefly the skin and sometimes also the deeper structures, due to infection with one or more closely allied species of fungi. The cutaneous lesions may take the form of papules, pustules, nodes, abscesses or ulcers. The condition is usually chronic and may cover a period of years. Potassium iodide internally, X-ray treatment, and excision of the lesions are among the therapeutic measures employed.

Blavatsky, blä-vät'ski, HELENA PETROVNA HAHN-HAHN (1831–91), theosophist leader, was born in Ekaterinoslav, Russia. Following her unhappy marriage to General Blavatsky in 1848, she spent much of her life in travel, visiting practically every point of the globe. In 1871 she founded in Egypt a short-lived society for the purpose of investigating spiritualistic phenomena. In 1873 she arrived in New York City where, with the assistance of W. Q. Judge (q. v.) and others, she founded the Theosophical Society in 1875. She again travelled in the East and in Europe, spending the last years of her life in London. Her works include *Isis Unveiled* (1877); *The Secret Doctrine* (1888); *The Key to Theosophy* and *The Voice of the Silence* (1889). See THEOSOPHY; THEOSOPHICAL SOCIETY.

Blay'don, town, Durham, England, on the river Tyne; connected by bridge with Newcastle. Coal mining is carried on, and there are manufactures of bricks, bottles, and chemical manure. Pop. (1921) 33,064.

Bla'zon, BLAZONRY, BLAZONING, the art of describing a coat of arms by defining in technical language its component figures, their positions, and their tinctures. See HERALDRY.

Bleaching, the art of removing the natural color of vegetable and animal products in such a way as not to injure them and to have them as white as possible.

The process of bleaching by chemical methods is of comparatively modern date, the methods employed in earlier times having been dependent principally upon the action of light and air. In Ireland, alkaline liquors, obtained from the ashes of sea-weed, were used for steeping and boiling linens, and in Holland, which was the centre of the industry in the eighteenth century, the fabric was steeped first in a weak lye, then in a hot potash lye, then given a thorough washing and steeped in buttermilk for several days, before exposure on the grass. In 1785 the bleaching properties of chlorine were discovered, and the fact that lime-water saturated with chlorine gas made a most effective bleaching solution revolutionized the industry.

The 'American Process,' which consists of singeing, washing, boiling with lime, souring with weak acid, boiling under pressure with alkali and resin soap, steeping in a solution of bleaching powder, souring again with weak acid, washing, and drying, came into vogue about 1837, and, with improvements, is still in general use. There are three kinds of bleach: the madder bleach, the market bleach and the Turkey-red bleach.

In the madder bleach, which is the most thorough calico bleach, the fabric is first singed, to remove loose hairy fibres projecting from the surface. This process is carried out in three ways — by gas, by plate, and by revolving rollers. In gas singeing the cloth is passed rapidly through Bunsen burners. For plate and roller singeing, the pieces are stitched end to end, and drawn over red-hot copper plates or a hollow cylinder.

After singeing, the fabric is thoroughly washed in a washing-machine, and is then allowed to steep or lie in a heap all night so that a fermentation may set in, which acts upon certain insoluble substances; or this step, known as gray wash, may be omitted and the goods may go directly to the lime-boil in which they are submitted to the action of lime-water, generally at a high temperature, and under pressure. After the lime-boil the fabric is washed in water and run through sulphuric or hydrochloric acid at 1° to 2° Tw. (Twaddell hydrometer), and then through water, in order to prevent its being made tender by the acid. It is then boiled under pressure from three to five hours, first with soda ash and resin, and then with soda ash alone. In the first *lye-boil* about 5 to 6 per cent. (by weight) of soda ash and 1 to 2 per cent. resin are used; in the second, 1 to 2 per cent. soda ash. After the lye-boils the goods are again washed in water.

Bleaching, or '*chemicking*', which consists in passing the goods through a clear solution of bleaching powder at ½° to 2° Tw. is the next step, followed by the '*white sour*' which decomposes any bleaching powder remaining on the fibre. The goods are then washed again and dried over copper cylinders.

The object of the lime-boil is to decompose the fatty, resinous, and waxy impurities, by converting them into lime soaps, which, still being insoluble, stick to the fibre, but are easily removed. Caustic alkalis would bring about a similar reaction, and at the same time soluble decomposition products would be formed; but lime is cheaper, and attacks the resinous matter more vigorously. In the souring, the acid decomposes the lime soaps with the formation of the lime salt of the acid used, and of the free fatty acids, in an insoluble form. These fatty acids are converted into sodium soaps in the lye-boils, which, now being soluble in water, are easily removed in the washing operations. A special feature of this method of bleaching, called the 'madder bleach,' is the use of resin soap; but the part it plays has not been satisfactorily explained. Practical experience has shown that, better than any other substance, resin soap removes certain impurities which cause uneven results in dyeing.

Market Bleach is used principally for goods which are to be sold in the white state; the essential difference between this and the madder bleach is the absence of resin soap in the lye-boil.

Turkey-red Bleach is a bleach used for goods which are to be dyed Turkey-red. It consists usually of one or two lye-boils in caustic soda, then souring with weak sulphuric acid, and finally washing and drying. Alizarin, a synthetic dye, is now used almost exclusively for Turkey-red dyeing.

Linen Bleaching.—Linen is bleached in a similar way to cotton, but the process is slower. It is, however, assisted by the exposure of the moist fabric to the action of light and air on the grass—fermentation and the formation of traces of hydrogen peroxide probably being the active agencies in this operation.

Wool Bleaching.—The natural impurities of raw wool are much greater than those of cotton, and may amount to from 30 to 80 per cent. They are of four kinds—(1) fatty and waxlike bodies soluble in benzine, petroleum, ether, or the like, to which the name 'yolk' or 'wool-fat' is given; (2) dried perspiration, soluble in water, known as 'suint;' (3) dirt, removable by water; (4) vegetable débris, removable by carbonization. The removal of these impurities takes place in the scouring; if this be neglected, the wool appears uneven or stripy when dyed. The scouring of wool is generally done in one of three ways: by saponification and washing out with water the soluble soap produced; by emulsification; or by solution in an organic solvent. The emulsification process is the one most generally employed. For the finest qualities of wool a good neutral soap is used; but for coarser and poorer qualities the soap is mixed with a small quantity of sodium carbonate or ammonia, though, owing to the ease with which wool is destroyed by alkalis, great care must be exercised in their use. The temperature of the scouring bath varies from 35° to 40° C. In many plants the waste scouring liquors are collected and used for the manufacture of lanolin.

A number of experiments have been tried to substitute for soap certain volatile liquids, which have a solvent action on the fatty and waxy bodies of the raw material. Of all substances carbon disulphide has been most successfully applied, but owing to mechanical difficulties, and the risk of fire and explosion, it has not thus far been extensively used in the industry. In order to remove the faint yellow tint of the wool after scouring, it is bleached, the agent usually employed being sulphur dioxide, sulphurous acid, or hydrogen peroxide. There are two methods of bleaching—*e.g.* gas and liquid bleaching. In the former, the wool, in the wet state, is placed in specially designed brick chambers and submitted to the action of sulphur dioxide, which is produced by burning the necessary amount of sulphur in an iron pot in one corner of the chamber. In liquid bleaching the material is steeped for several hours in a solution of sulphurous acid or a solution of sodium bisulphite, to which the requisite amount of hydrochloric acid has been added. The best results, however, are obtained by the use of hydrogen peroxide or sodium peroxide, and this agent is used in the higher class goods.

Silk Bleaching.—Silk consists principally of two substances—fibroin, the fibre proper and a gumlike body, sericin. The latter is removed in the scouring operation, which consists in working the silk in a solution of soap at 90° to 95° C., and afterward in hot water which contains a small amount of sodium carbonate. The waste soapy liquors, containing large quantities of sericin, are collected and extensively used in dyeing, under the name of 'boiled off liquor.' After scouring or 'boiling off,' the silk is bleached by means of sulphur dioxide in a manner similar to that described in the case of wool; by hydrogen peroxide, now most generally employed, or by permanganate of potassium. Consult Higgins' *A History of Bleaching* (1924); Trotman's *The Bleaching, Dyeing and Chemical Technology of Textile Fibres* (1925).

Bleaching Powder, $CaOCl_2$, a compound formed by passing chlorine gas over cold slaked lime. When freshly made it consists of an oxychloride of calcium, but by the absorption of moisture it is gradually converted into a mixture of chloride and hypochlorite of calcium. It is commonly known as chloride of lime, and is used as a source of chlorine for bleaching purposes, also as a disinfectant.

Bleak, a Cyprinid fish allied to the bream. The common bleak (*Alburnus lucidus*) is a small silvery form common in fresh water in the more northern parts of Europe, usually about 5 to 6 inches in length, and with a protruding lower jaw. The scales are used in the manufacture of artificial pearls.

Bleeding, or BLOOD-LETTING, is commonly resorted to in surgical practice for the relief of congestion; and in this sense the term covers many different methods by which blood may be removed from the body—*e.g.* venesection or phlebotomy, cupping, and the use of leeches. Bleeding, after having been terribly misapplied for many generations and then practically abandoned, is now advocated in certain cases of acute inflammation in suitable subjects, or to relieve an overburdened heart. It is by no means the only example of an old practice in medicine or surgery which had been dropped and then taken up again with greater moderation. Practically any form of counter-irritation or depletion even if it does not remove blood, or all the constituents of the blood, from the body, but merely withdraws some of them, or draws the blood away from a definite spot, may be considered as a modified form of bleeding. Hence, dry-cupping, poulticing, blistering, and strong purges are modifications of the same principle. See HÆMORRHAGE; WOUNDS; VENESECTION.

Bleek, blāk, FRIEDRICH (1793–1859), German Biblical scholar, was born in Ahrensbök in Holstein. He became professor of theology at Berlin (1823), and at Bonn (1829). His commentary on *Der Brief an die Herbräer* (1828–40) ranks among the foremost exegetical studies. His *Introduction to the Holy Scriptures* (1860–2), of numerous editions, has been translated into English—the Old Testament by Venables (1869), the New Testament by Urwick (1869), and also his *Lecturs on the Apocalypse* (1875). His other works include *Synoptische Erklärung der drei ersten Evangelien* (1862), *Vorles. über die Briefe an die Kolosser*, etc. (1865), and *Der Herbräerbrief erklärt* (1868).

Bleek, WILHELM HEINRICH IMMANUEL (1827–75) German philologist, son of Friederich Bleek, was born in Berlin. He took part (1854) in Blaikie's Niger expedition, and (1855–6) spent eighteen months in the interior of Natal. He became curator of the Grey Library in Cape Town and carried on valuable research work. His published works include *Languages of Mozambique* (1856); *Handbook of African, Australian, and Polynesian Philology* (1858–63); the unfinished but important *Comparative Grammar of South African Languages* (1862–9); *Origin of Language* (1869), in which the Darwinian theory is applied; and *Reynard the Fox in South Africa* (1864).

Bleiberg, blī'ber*ch*, village,

Austria, in Carinthia, 9 miles west of Villach. It has valuable lead mines, the most extensive in Austria. Pop. 5,000.

Bleibtreu, blīp'troi, Georg (1828–92), German painter of battle scenes, was born in Xanten, on the Rhine. He was the pupil of Hildebrandt and in 1849 attracted much attention by *The Battle of Bau, in Schleswig.* Afterward he painted a series of pictures drawn from episodes in the war of independence (1813–15), of which the most celebrated are *The Attack on the Grimma Gate at Leipzig* and the *Battle at Waterloo* (1858). From 1864 he painted incidents of the Prusso-Danish and Austro-Prussian Wars, the best being *The Passage of the Prussians to Alsen* and *The Battle of Königgrätz,* both in the National Gallery at Berlin. Later he painted episodes of the Franco-German War, such as *The Capitulation of Sedan, The Bavarians under General von Hartmann before Paris, King Wilhelm after the Battle at Gravelotte,* and *Napoleon retiring after Waterloo.* His paintings are vigorous and powerful, and his coloring brilliant.

Bleibtreu, Karl (1859–), German man of letters, was born in Berlin. He was engaged in editorial work for a few years and later devoted himself to a varied field of literature. His published works include somewhat turbulent descriptions of battles (*Dies Irae . . . Sedan,* 5th ed. 1902); *Cromwell bei Marston Moor* (1889); *Waterloo* (1902); books about Napoleon (1888, 1891); Frederick the Great (1888, 1892); Byron (1886, 1897); English literature (1887–8); *England's Waterlooluge* (1915); *Stegemanns Weltkrieg und die Marneschlacht* (1916).

Blekinge, blā'king-*e*, county, in Southern Sweden, with an area of 1,173 square miles, 35 per cent. of which is forest. The salmon fishery, especially in the River Morrum, is considerable. For practically eight centuries it belonged to Denmark, but was ceded to Sweden in 1658 by the peace of Roskilde. The chief town is Carlscrona. Pop. (1920) 147,098.

Blemmyes, blem'i-ēz, ancient people of Hamitic origin, who lived in the south of Egypt.

Blende, a name given to sphalerite or zincblende by the early miners. It is still very generally used by miners and prospectors.

Blenheim, blen'im, or Blindheim, village, Germany, in Bavaria, near the left bank of the Danube, 23 miles northwest of Augsburg. Near here, at Höchstädt, on Aug. 13, 1704, the Duke of Marlborough and Prince Eugene, commanding the combined armies of the allies (England, Germany, Holland, and Denmark), defeated the French and Bavarians under Tallard, Marsin, and the elector of Bavaria. The battle has been celebrated in verse by Southey (1798) and Dennis (1705).

Blenheim Park, parish, England, near Woodstock, Oxfordshire, on the Glyme River. The name of the park was changed when Queen Anne granted it to John Churchill, Duke of Marlborough, for his famous victory at Blenheim in 1704. Parliament made a grant of about £500,000 for a palace, designed by Sir John Vanbrugh.

Blenk, James Hubert (1856–1917), American Roman Catholic prelate, was born in Neustadt, Bavaria. He studied theology in France and Ireland and in 1885 was ordained priest. He was president of Jefferson College Convent (La.) in 1890–96, became bishop of Porto Rico in 1899, and archbishop of New Orleans in 1906.

Blenker, Louis (1812–63), German-American soldier, was born in Worms, Hesse-Darmstadt, Germany. He served in the Bavarian legion which accompanied Prince Otho to Greece, 1833–7; engaged in the wine business at Worms, joined the revolutionary party in that city, and was obliged to retire to Switzerland, emigrating to the United States the same year (1849). He entered business in New York City and organized the 8th regiment of New York Volunteers, leading it to the front as colonel. Blenker's regiment was a part of the division which covered the retreat at the first battle of Bull Run, and he was promoted brigadier general, commanding a division in the Army of the Potomac during the remainder of his service. He died from injuries received from a fall from his horse.

Blenkinsop, John (1783–1831), inventor of what may be considered the first commercially successful locomotive steam-engine, a cog-wheeled engine which was employed on Hunslet Moor, near Leeds, to draw coal up to a load of thirty tons (1812 *et seq.*). George Stephenson saw Blenkinsop's engine at work before building his famous *Rocket.*

Blennerhasset, blen-*er*-has'-et, Harman (1765–1831), English immigrant of Irish descent in America, remembered for his connection with the Aaron Burr Conspiracy. He was born in Hampshire, Eng., emigrated to America, and, about 1798, built a fine residence on what has become known as 'Blennerhasset' Island, a small island in the Ohio River about two miles below Parkersburg, Va. (now W. Va.). There he devoted himself to science and to music, until, in the summer of 1806, he came under the influence of Aaron Burr, who presented to him a project for a great land speculation in Louisiana and an invasion of Mexico, when the war between the United States and Spain, which then seemed inevitable, should break out. The island became a centre of preparations for the Burr expedition, and in December, 1806, it was seized by a force of Ohio militia. Subsequently Blennerhasset was arrested and in June, 1807, was indicted, with Burr, for misdemeanor and treason, but on Burr's acquittal he was released, and, his island having been sold to pay his debts, he passed the last years of his life in poverty.

Blennorrhœa. See Gonorrhœa.

Blenny, a name given to the members of the family Blenniidæ, which includes a large number of small littoral fishes, all having the ventral fin formed of less than five rays, and jugular in position, as in the cod family. In many cases these ventral fins are reduced to rods, which are used by the fish in travelling over the sea bottom. For examples, see articles Shanny; Wolf-fish.

Bleph'ari'tis, a chronic inflamed condition of the eyelids.

Bleriot, blē'rī-ō, Louis (1872–), French aeronaut, was born in Nantes. He was graduated from the Central School of Arts and Manufactures in Paris in 1895. In 1900 he turned his attention to flying machines, and constructed an artificial bird with flapping wings, run by a motor. He also experimented with biplanes and the Langley type of aeroplane. The monoplane called by his name grew out of the last-named machine, and is notable for its simplicity, stability, and lifting power. On July 25, 1909, he flew across the English Channel from Baraques to Dover in 37 minutes.

Blessington, Marguerite, Countess of (1789–1849), Irish novelist and writer, was born in Knockbrit, Tipperary. She was an intimate friend of Lord Byron; held a little court for many years at Gore House, Kensington; but her equivocal connection with Count d'Orsay who was the husband of her stepdaughter, cut her off from society and overwhelmed her with debt. The couple were obliged to flee to Paris (1849), where Lady Blessington died in poverty. She is the author of *The Idler in France* (1841), *The Idler in Italy* (1841), and *Conversations with Lord Byron* (1834). She also wrote a number of novels, the best known of which are *Grace Cassidy, or The Repealers* (1833), *The Victims of Society* (1837), *The Follies of Fashion* and *The Confessions of an Elderly Lady* (1838).

Blewfields. See Bluefields.

Blicher, Steen Steensen

(1782–1848), Danish novelist and poet, was born in Vium, a village of Viborg. From 1819 he led the life of a poor parson, till his growing needs forced him to produce those works which have made him one of the favorite novelists of the Danish nation. Beginning with *En Landsbydegns Dagbog* (1824), he wrote a whole series of masterly tales of Danish, especially Jutish, peasant life, culminating in *E Bindstouw* (1842), written in the Jutland dialect, and incomparably his best work. What Hardy has done for Wessex, Blicher has done for Jutland, but in a spirit of bright and pleasant humor. Consult his own *Autobiography*, prefixed to his *Samlede Noveller;* Kristensen and Lund's *Blicher's Liv og Gjerning.*

Blickling Homilies. The unique MS. of the Blickling Homilies is at Blickling Hall, near Aylsham, in Norfolk, England. They belong to the time between Alfred and Ælfric; they are not homogeneous in character, and may cover a wide period of time. The date 971 occurs in one passage. These homilies, full of legendary, apocryphal, unscriptural matter, form a striking contrast to those of Ælfric (q.v.), who, as is clear from several passages, intended some of his own homilies as a corrective to them.

Blida, fortified town, Algeria, 23 miles southwest of Algiers, at the foot of the Atlas Mountains. It is famous for its orange groves. There is also some trade in copper, lead, and cotton. Pop. (1911) 35,461 (11,219 Europeans).

Bligh, WILLIAM (1754–1817), English admiral, was born in Cornwall. He entered the navy, and sailed under Captain Cook in his second voyage round the world (1772–4). As a lieutenant he took part in the action off the Dogger Bank (1781), and in Howe's relief of Gibraltar (1782). In 1787 he was sent by the British government, as commander of the *Bounty*, to Tahiti. During their six months' stay on the island his men became completely demoralized, and mutinied. On April 28, 1789, Bligh, with eighteen men, was cast adrift in an open boat, while the mutineers turned back to Tahiti, and ultimately settled on Pitcairn's Island. After almost incredible hardship, Bligh arrived at the island of Timor, near Java, on June 14, having sailed 3,618 miles. (See BOUNTY, MUTINY OF THE.) In 1805 he was governor of New South Wales, but was so harsh as to cause universal dissatisfaction; and in 1808 the civil and military officers of the colony arrested him. He was kept in prison by the colonists for two years. The officer who arrested him was tried in England and cashiered. After Bligh's return to England he was raised (1811) to the rank of admiral.

Bligh Islands, a portion of the Fiji Archipelago, in nearly 180° long.

Blight, a diseased state of cultivated plants, especially cereals and grasses. The term has been vaguely and variously used, having, in fact, been applied by agriculturists to almost every disease of plants in turn, however caused, especially when the plant dies before reaching maturity. See PLANTS, *Diseases.*

Blight, American, the name given to a disease that attacks apple and pear trees throughout North America east of the Rocky Mountains. The disease affects the bark, which falls off, and thus causes the death of the tree. It is due to one of the aphids (q.v.), sometimes called the 'woolly aphid,' from the white protective material, like cotton wool, with which it covers itself. Eggs are laid in minute crevices of the bark by oviparous females in autumn, thus spreading the pest. The bark splits open, canker begins, and the tree, if not killed, becomes of little value. No part of the tree is safe from attack. Washing, spraying, or painting with paraffin and soft soap or an insecticide two or three times in the spring and early summer is one of the most effective remedies. This is best applied after the sun has gone down, in order not to injure the foliage. Spraying in winter with a solution of caustic soda and pearl ash is also recommended. Firs and larches are also subject to the blight. Consult the publications of the U. S. Department of Agriculture.

Blimbing, or BILIMBI, a pulpy, yellowish, acid fruit, about the size of a hen's egg, and found on the cucumber tree (*Averrhoa bilimbi*) of the order Oxalidaceæ. The acidity is due to an oxalate of potassium. It is eaten by natives of India and the East Indies, and is also used in the form of pickles.

Blind. See BLINDNESS.

Blind, KARL (1826–1907), German author and revolutionist, was born in Mannheim. Condemned, for taking part in the revolution of 1848, to eight years' imprisonment, he was freed by the people and soldiery. A member of the embassy of Baden and Bavaria to Paris, he was there imprisoned, on the charge of participating in Ledru-Rollin's rising, and then banished from France. He went in 1852 to London, and there formed intimate relations with the leaders of European democracy—Mazzini, Garibaldi, Louis Blanc, etc. He furthered the Schleswig-Holstein movement, and fought in the war of 1870–71. His writings range over Germanic history, literature, and folklore, as well as politics.

Blind Fish. In situations where light is absent, blind animals are commonly found. The absence of the normal stimulus has necessitated cessation of function and various degrees of degeneration in structure. In most cases rudimentary traces of eyes prove the fact of degeneration; and that the latter is largely the direct effect of the absence of the stimulus preserving the health of the eye is allowed by most. The blind fish of the Kentucky caves (Amblyopsis) has degenerate hidden remnants of eyes; *Lucifuga dentata*, a very different form, found in the subterranean caves of Cuba (though member of a marine family), is also blind; the hag fish (*Myxine glutinosa*), though perhaps hardly a fish in the technical sense, has also virtually lost its eyes in association with its habit of spending much of its life buried in the mud, or parasitically within cods and haddocks; the primitive vertebrate, the lancelet (Amphioxus), is in the same state.

Blind Harry. See HENRY THE MINSTREL.

Blindness. In medical terminology the expression 'blindness' means absolute sightlessness; what is popularly termed 'partial blindness' is known medically as Amaurosis or Amblyopia. (See AMBLYOPIA.) Blindness cannot always be accounted for. In general, it may be said to arise from inflammatory or degenerative changes in some part of the path between the cornea without and the visual centre (or that part of the gray matter of the brain especially concerned in sight) within. The eye is so delicate an organ that inflammation of any part may easily spread to the others, and skilled assistance should be called in whenever its safety is concerned.

Blindness is either congenital or acquired. Acquired blindness is due to pus infections (particularly gonorrhœa), syphilis, sympathetic inflammation, accidents (especially industrial accidents), progressive near-sightedness, and various inflammatory conditions. It may also be due to poisoning by lead, tobacco, or wood alcohol, the last used extensively as an adulterant in liquors.

The various forms of eye disease, such as Cataract, Keratitis, Iritis, and Retinitis (qq.v.), are treated under their several headings. One, however—*viz., Ophthalmia Neonatorum* (sore eyes of the new-born)—is particularly mentioned here because of its special importance. The disease starts with superficial inflammation of the eyes, caused by contagion during birth. It leads to ulceration and rapid destruction of the eyes, and is extremely contagious, being readily transmitted from the child to any one having to do with it. In nearly every instance the disease may be prevented from developing by the instillation of a weak solution of nitrate of silver in the eyes of the new-born child; it may be cured by the same method, if treatment is not too long delayed.

One-tenth of all cases of blindness may be said to be due to this disease. The number of cases of preventable blindness is so great, and the education and maintenance of the blind so costly, that the matter is not alone of importance from a medical point of view, but has become a serious economic problem. Many States have legislative measures requiring that all cases of inflammation or swelling of the eyes of new-born children be reported to the local health officer, either by the nurse in charge of the infant or by the physician. In addition, some States furnish physicians with prophylactic outfits.

Children are sometimes several months old before it is discovered that they are blind. By the third month the healthy child shows signs of recognition on seeing a familiar face; but even after a few weeks it will take pleasure in a bright light, and its perception of it can be tested by moving a candle before the eyes and noting whether they follow it. When over two months old the child with normal sight will blink if an object is suddenly thrust near its eyes. See BLIND, TRAINING OF.

Blindness, Color. See COLOR BLINDNESS.

Blind Spot IN THE EYE, that part of the retina which is pierced by the optic nerve, and which is insensible to light. If, having closed one eye, a person fixes the other on a black spot on a white ground, any small black object, gradually drawn away sideways from that spot, will at one point disappear, but will presently reappear after having been further removed. The limits of the blind spot can be found by performing the same experiment in different directions. The blind spot is unnoticed in looking at objects in the ordinary way for at least three reasons. It lies outside the field of distinct vision—*i.e.*, it is always at a point remote from that on which the eyes are fixed. Again, the same point of any object does not fall on the blind spots of both eyes at the same time. Lastly, the blind spot causes blankness, and not a perceptible darkness, which can only be distinguished by those parts which can also distinguish *light.*

Blindstory, in architecture, the middle story of a large church, over the pier arches and under the clerestory windows. The technical name is 'triforium,' as the gallery or open space between the vaulting of the nave and the roof of the aisles generally opens on the nave by triple apertures. The ornamental arrangement of the triforium varies considerably. In the Norman style it is often formed of a single complete arch, or of an arch subdivided into smaller ones, supported on diminutive shafts. In the Early English style a range of small arches is not uncommon, and sometimes two or more larger arches subdivided are used. In the Decorated and Perpendicular styles the space occupied by the triforium is often much reduced. In ancient times the triforium was appropriated to the use of females.

Blind Tom (1849–1908), musical genius, was born near Columbus, Ga., the son of negro slaves. He was born nearly blind and half idiotic, but possessed the faculty of playing music by ear, after hearing the air. He made his first appearance in New York, at Hope Chapel, in 1861, and subsequently gave concerts all over the United States and in many parts of Europe. He was said to have memorized 5,000 pieces of music, including the most elaborate works of the great composers.

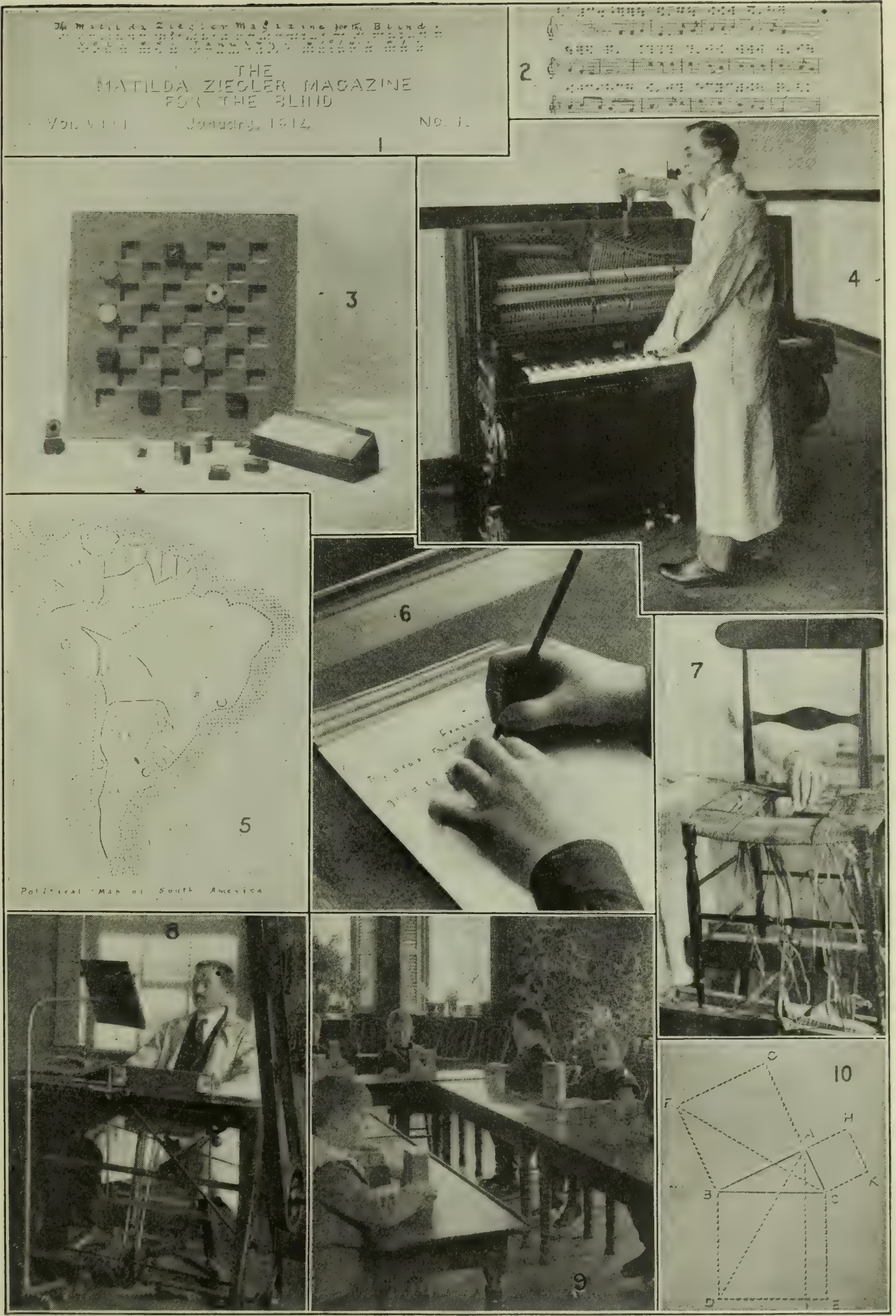
Blind, Training of the. Although there were occasional illustrious blind people—notably Nicholas Saunderson, Maria von Paradis, Ziska, John Metcalf, Dr. Blacklock, and Huber—before the latter part of the eighteenth century, the first effort to ameliorate the condition of the blind in general was begun at this time. Previous to that period they were a helpless class, for whom there was little resource but begging. The degraded state of the masses of the blind in France is shown by the following incident: In 1771, at an annual fair in Paris, an innkeeper had a group of blind men attired in a grotesque manner, wearing long, pointed hats and pasteboard spectacles. Their leader was decorated with a peacock's tail and the headdress of Midas. In this condition they gave a burlesque concert for the profit of their employer.

Among those who gazed at this outrage to humanity was the philanthropist Valentin Haüy (1745–1822). After he had gathered all the information possible respecting the blind, he began teaching a blind boy who had earned his living by begging at a church door. Encouraged by the success of his pupil, Haüy collected other blind persons, and in 1784 founded in Paris the first school for the blind, the Institution Nationale des Jeunes Aveugles, and commenced the first printing in raised characters. In 1786 he exhibited before Louis XVI. and his court at Versailles the attainments of his pupils, and published an account of his methods, entitled *Essai sur l'Education des Aveugles.* As the novelty wore off, contributions almost came to an end, and the school for the blind might have ceased to exist had it not been taken under the protection of the state in 1791.

The work of Haüy, the great apostle of the blind, was taken up by Klein of Vienna, by Zeune of Berlin, and by others on the Continent; in Britain especially by Gall of Edinburgh and Alston of Glasgow. Later, every country in Europe came to support one or more residential schools for the blind. Comparatively little has yet been done in Asia and Africa.

In the United States, citizens of Boston, New York, and Philadelphia started our three pioneer schools. In 1829 Dr. John D. Fisher founded the first of these, in Boston. He had visited the Paris school, but the one he established soon surpassed those of Europe. State aid was secured from the start; private interest was aroused and maintained; and Dr. S. G. Howe, the Philhellene, became director, and remained during his long life the leader in this branch of education. A wealthy merchant, Col. T. H. Perkins, gave the enterprise a mansion, valued at $30,000—hence the name Perkins Institution; and the new school was opened in 1831. Dr. Howe's instruction of Laura Bridgman (q.v.) began in 1837, and his success commanded attention throughout the whole world. The New York institution was also opened in 1831, actually a few months before that in Boston, under Dr. John D. Russ, another Philhellene. The Philadelphia Institution, founded in 1833 by the Society of Friends, secured as its first principal Julius Friedlander, who had had European experience.

These three schools began as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Political Map of South America
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TRAINING OF THE BLIND.

1. Illustration of point prints. 2. Illustration of music in points. 3. Game of checkers. 4. Piano tuning. 5. Desk outline map in points. 6. Pencil writing. 7. Rush seating. 8. Brass plate making on stereotype maker. 9. Kindergarten occupations. 10. Geometry diagram.

private corporations, and remain so to this day. Through exhibitions of their pupils public interest was aroused in other States, and public State institutions were organized in quick succession—Ohio in 1837, Virginia in 1839, Kentucky in 1842, and so on. In some cases, departments for the blind were added to existing institutions for the deaf; but wherever possible this undesirable association has been terminated. M. Anagnos, the second director of Perkins Institution, opened in 1887 the first Kindergarten for the Blind; and Mrs. Emily W. Foster, in 1893, started the first Nursery for Blind Babies, at Hartford, Conn. In 1900, through the influence of Frank H. Hall, then superintendent of the Illinois Institution, the public schools of Chicago opened a class for blind children. A number of other cities have followed. In 1912 there were reported to the U. S. Bureau of Education 60 residential schools and day schools, having a total of 4,992 pupils and 652 instructors.

There is no better or more thorough elementary schooling given blind children anywhere than in Germany and Austria. But as a rule this ends at the age of fourteen, after which the instruction is purely vocational—and that, handicraft, with some little piano tuning. The general assumption on the Continent is that the blind cannot make a living in the world, and ought not to be expected to do so. This conviction has provided efficient shop schools, followed by employment in shop or at home, resulting in a practically complete paternal care of the blind from cradle to grave. The original Paris school has always been more optimistic in aim, having taught music vocationally, together with piano tuning.

Since 1872, Dr. (later Sir) Francis Campbell, an American and blind, has conducted in London, England, the Royal Normal College and Academy of Music for the Blind, a residential school furnishing unexcelled vocational opportunities in school teaching, music, and piano tuning; and the remarkable success of its graduates has powerfully affected the aims of the other schools of Great Britain and Ireland.

According to the views of Sir Francis Campbell, besides regular gymnastic training we should endeavor to give young blind children that spontaneous activity and love of play which is the universal impulse of all healthy seeing children. The first requisite is a suitable playground, specially adapted to meet the wants of the blind. Besides a free space where they can run and play, it should have a supply of swings, springboards, stilts, bowling alleys, etc. The pupils should be encouraged to enter various competitions, as walking, running, jumping, leapfrog, sack racing, shot putting, and tug-of-war. Cycling, rowing, swimming, skating, and coasting are also beneficial.

The school curriculum should also be varied according to the age and capacity of the pupils, while the teacher's object should be to develop the powers of observation, train the reasoning faculties, strengthen the memory, cultivate clear and concise expression, and stimulate a love of reading and literature. All children of average intelligence should be taught typewriting. From the earliest years manual dexterity should be cultivated by kindergarten work, modelling, sewing, knitting, and sloyd.

Sir Francis' scheme of education makes music in its various branches, when properly taught, the best and most lucrative employment for the blind. The musical instruction, in its several branches of harmony, pianoforte, organ, and vocal culture, should be addressed to the *mind*, not merely to the *ear*. If the mental faculties have not been developed and thoroughly disciplined, the blind musician, however well he may play or sing, will be a failure as a teacher. The musical instruction must be more thorough, more analytical, more comprehensive than corresponding instruction given to seeing persons.

Piano tuning is another excellent form of employment for the blind. Many can be trained to become successful piano tuners when they have reached an age that renders training for the profession of music impossible. The seeing who excel in the business go through a long apprenticeship, and one must give the blind even more careful preparation.

In America not a few have coupled piano tuning with piano selling, and have succeeded well. The businesslike have often done better in some commercial pursuit than by following an institutionally taught occupation. For girls and young women, teaching and a capacity for housework, developed at school, have proved most effective. Indeed, a cultivated blind girl who is so agreeable and efficient at home that she is not only welcome but needed there should be considered self-sustaining.

Because blind children are comparatively few, and these live scattered in city and country, and because their proper training requires not only special apparatus but different departments of study, with wide opportunities for a rich and full life during youth, most of their schools are residential, the pupils going home for the vacations. Nevertheless, in large cities, where the will has created the necessary machinery, day-school centres for the blind are made to thrive, as for many years in London and Berlin, and more recently in Chicago, Milwaukee, Cincinnati, New York, and a few other American cities. Except in Berlin, where the instruction corresponds in spirit and aim with that of the local institutions, and in London, where it is the ambition of the brighter pupils to gain as soon as possible a scholarship at some residential school like the Royal Normal College, this day-school plan is dictated mainly by a conviction that even handicapped children will be the better assisted in life by going to school with other children with whom they will have to live and compete in the world. This view is promising for the blind in proportion as the instruction is balanced and comprehensive enough to develop the pupil in several lines, and to the utmost; in other words, when it considers the child rather than the curriculum, and the fitting of him into the public school system. But all this involves an expenditure for physical, manual, domestic, and musical training beyond what is usually required for the seeing child. Until this is provided, private agencies must offer opportunities in the various practical and inspirational activities of the times—as in the case of the New York Association for the Blind.

The American aim in the education of the blind is to provide the best and most comprehensive schooling obtainable, to graduate the greatest possible number with high-school diploma and with vocational training in one or more pursuits, and to expect these to make good in the world. The plan is essentially optimistic, and has had good results, especially where the school stands back of the graduate. It has often been lessened in result by changes in superintendents for political reasons, and by the inevitable weakening effect upon the pupils' minds of receiving much for nothing.

TYPES AND PRINTING.—To Haüy belongs the honor of being the first to emboss paper (1784) as a means of reading for the blind. His books were embossed in large and small italics, from movable type set by his pupils. In 1827 James Gall of Edinburgh embossed some elementary works; his plan was to use serrated lines and replace curves by angles. In 1832 the Edinburgh Society of Arts offered a gold medal for the best method of printing for the blind, and it was awarded (1837) to Dr. Edmond Fry of London, whose alphabet consisted of ordinary capital letters without their small strokes. In 1836 Rev. W. Taylor of York and John Alston of Glasgow began to print with Fry's type.

In 1833 printing for the blind was commenced almost simultaneously in Boston and Philadelphia. Howe, in Boston, used small English letters without capitals, angles being employed instead of curves; while Friedlander, in Philadelphia, used only Roman capitals. About 1838 Lucas of Bristol, England, a shorthand writer, and Frere of London both introduced alphabets of simpler forms, and based their systems on stenography. In 1847 Moon of Brighton brought out a system which partially retains the outline of Roman letters. The preceding systems are all known as line types. These do not lend themselves to tangible writing, and have been superseded by point type systems.

In 1829, Louis Braille, one of the greatest benefactors of the blind, a blind music teacher in the Institution des Jeunes Aveugles, Paris, devised an alphabet in which the characters are formed by an arrangement of dots. The signs of the *Braille Alphabet* are purely arbitrary, and consist of varying combinations of six points placed in an oblong, thus: ⠿ of which there are sixty-three possible combinations. Such a point type has the double advantage of superior tangibility and superior writability; and it further supplies a complete mode of expression for words, music, and mathematics. This alphabet, with modifications, prevails in most countries. In the United States, two such modifications have been in use—the New York point, in which the characters are not more than two points high and four long, and the American Braille, whose characters are made in the original base. In 1916 the Halifax convention of the American Association of Instructors for the Blind voted to discard the New York point and American Braille in favor of the style of type used in England, known as Revised Braille, Grades 1 and 2.

Appliances.—For writing the point alphabets, simple and ingenious slates have been constructed. Two American superintendents, Hall of Illinois, in 1892, and Wait of New York, in 1893, brought out the first practical point typewriters, the Braillewriter and the Kleidograph. Similar but heavier machines by the same inventors, the Stereotypemaker, in 1893, and the Stereograph, in 1894, by which embossed metal plates can be rapidly made ready for an indefinite number of paper impressions, have greatly cheapened and facilitated the means of printing for the blind.

Many devices have been contrived to enable the blind to keep the lines apart when writing with lead or fluid pencil. Different ciphering boards have also been constructed, of which one of the simplest and best is the Taylor octagonal board, with star-shaped openings for the insertion of a square type or pin, bearing on one end a ridge, on the other two points. Eight different positions for each end furnish sixteen characters; only a single kind of type is therefore required for arithmetic, and two kinds for algebra. Still another single-type slate is the French *cubarithme*, having shallow square sockets for the reception of cubes bearing Braille point characters, which in the different positions of the cube supply the figures for arithmetic. For geometry, books are prepared with raised diagrams lettered in point. Geography is taught by means of paper desk maps outlined in relief, of wooden dissected maps, or of relief globes. A slight modification of the common table games renders them usable by the blind.

Instruction and Occupations.—In 1882 William Moon planted in Philadelphia, and John P. Rhoads later kept alive, the English institution of teaching the adult blind in their homes. Since 1900 other such home-teaching agencies have sprung up in various States, teaching chiefly reading and simple handicrafts, and giving inspirational advice and suggestion. Before then, except in a few working homes, little had been systematically done in aid of the adult. Since 1900 a wave of interest in their behalf has spread over the United States, however, and we find private associations and public commissions both training and employing numbers of men and women and assisting them to self-support. Perhaps the best known to-day are the New York Association, which teaches and employs men and women and conducts all manner of ameliorating and quickening agencies, and the Massachusetts Commission, which with its chain of small shops without dormitory attachment, bureau of statistical information, campaign for the prevention of blindness, and investigation into the condition of those not blind but having defective vision, is especially efficient. There is no better illustration of an effective agency of this kind, conducted with a minimum of outlay in money, than the Exchange and Salesroom of the Pennsylvania Institution for the Instruction of the Blind at Philadelphia.

In America the handicrafts usually taught to boys and young men are the reseating of chairs with cane, splint, or rush, cornbroom making, and mattress renovating. Basket making, carpet and rug weaving, netting and mop making are locally taught. The occupations taught girls and young women are hand and machine sewing, knitting and crocheting, fancy weaving, reed basketry and chair caning; also domestic science and simple housework.

No special provision has yet been made in the United States for those blind who are also feeble-minded.

Publications.—Since 1879 the United States government has subsidized with $10,000 annually the American Printing House for the Blind at Louisville, Ky. From this institution every school in the country has been able to draw embossed books, without expense, in proportion to the number of its pupils. Since 1903 individual schools have installed small printing plants, and have printed books, maps, examination papers, and other matter, as their school departments required. Practically all the State libraries, over 30 free public city libraries, and nearly 50 school libraries maintain departments of embossed books, which furnish abundant instruction and relaxation to many thousands of readers.

Eight periodicals in raised type are published—the *Matilda Ziegler Magazine* alone issuing 7,000 copies every month. The mails carry such books free of postage. America issues a splendid quarterly in common print, *The Outlook for the Blind*, begun in 1907, which serves as an organ of intercommunication and inspiration, and is a means of uniting all activities for and by the blind.

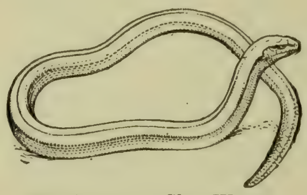
There has existed since 1853 an organization which meets biennially, called the American Association of Instructors of the Blind; and another, since 1895, meeting every three years, the American Association of Workers for the Blind.

At the Perkins Institution, Watertown, Mass., may be consulted a special library about blindness and the blind; also an historical museum of objects and appliances, used for their convenience, instruction, and amusement.

Statistics.—According to the Federal Census of 1910, 62 out of every 100,000 persons in the United States were blind; and in that year the total blind in the country numbered 57,272 persons. The total number of blind persons in the world was estimated at 2,390,000; but this number has since been greatly increased by the effects of the present war. Indians suffer much more than other races; blindness is more prevalent among negroes than among whites, and among men than women. Approximately one-half —49.4 per cent.—of the blind population reported in 1910 were sixty years of age and over. Among children under five years only 5 in every 100,000 were blind; among persons eighty-five years of age and over, 2,575 in 100,000 were blind. Comparisons with earlier censuses indicate that there has been a decrease in the prevalence of blindness among the younger classes of the population. Of the 7,976 blind males gainfully employed, 1,768 were farmers, 665 broom makers, 646 musicians and music teachers.

Bibliography. — Consult catalogue of Special Library of Books Relating to the Blind, Perkins Institution for the Blind; Anagnos' *Education of the Blind;* Allen's *Education of Defectives* and *Tangible Writing of the Blind;* Mell's *Encyclopädisches Handbuch des Blindenwesens; Reports* of the Massachusetts Commission for the Blind; *Proceedings* of the National Education Association; *Outlook for the Blind* (quarterly); Javal's *On Becoming Blind;* La Sizeranne's *Blind as Seen through Blind Eyes* and *Blind Sisters of St. Paul* (1907); Baker's *Sightless Athlete, How the Blind are Taught to Take Exercise* (1908); Richards' *Servant of Humanity: S. G. Howe* (1909); Illingworth's *History of the Education of the Blind* (1910); Winnie's *History and Handbook of Day Schools for the Deaf and Blind* (1912); *American Encyclopædia and Dictionary of Ophthalmology* (vols. i. and ii., 1913); Helen Keller's *Story of My Life* and *Out of the Dark* (1913).

Blindworm, or SLOW WORM (*Anguis fragilis*), a limbless lizard found throughout Europe, and in North Africa and Western Asia. Related species occur also in the warmer parts of America. In form it is worm-like, and only internal traces of limbs are present; the nostril is situated in a shield; the eyes are small but serviceable, the eyelids scaly and movable; the teeth are long, pointed, and directed backwards; the scales are smooth, and those of the head very distinctive. The young are whitish above with a median black stripe, black on the sides and below; the adults are brownish above and black below, often relieved by longitudinal lines. The full size is about a foot, about half of which is the tail. Blindworms give a feeble bite, but are harmless. They become rigid when caught, and in this state an attempt to bend the greatly contracted muscles results in breakage.



Blindworm, or Slow Worm.

The name Blindworm or Blind Snake is also bestowed on *Ophisaurus ventralis*, a harmless 'glass snake' found throughout the United States from Florida to Illinois.

Bliss, CORNELIUS NEWTON (1833–1911), American public official, was born in Fall River, Mass. In 1848 he removed to Boston, where in 1866 he became a member of a commission firm, which he subsequently represented in New York City. In 1881 the New York house took the name of Bliss, Fabyan & Co., and became one of the leading dry goods commission houses of the United States. Bliss filled numerous honorary positions in Republican State and national politics, and was treasurer of the National Committee from 1892 to 1908. He served as Secretary of the Interior from 1897 to 1899.

Bliss, FREDERICK JONES (1859), American archæologist, was born at Mount Lebanon, Syria, and was graduated from Amherst College in 1880. From 1890 to 1900 he was explorer to the Palestine Exploration Fund, chiefly at Tell-el-Hesy and at Jerusalem, where he made important discoveries. In 1911 he became dean for men at the University of Rochester. He has written: *A Mound of Many Cities* (1894); *Excavations at Jerusalem, 1894–7* (1898); *Excavations in Palestine* (1898–1900); *The Development of Palestine Exploration* (1906); *The Religions of Modern Syria and Palestine* (1912).

Bliss, PHILIP PAUL (1838–76), American evangelist, was born in Clearfield, Pa. He early developed a taste for music, and was a composer of songs and hymns, and a singing evangelist. Many of his hymns—*e.g., Hallelujah! 'tis Done, Pull for the Shore, Hold the Fort*—became quite popular. He was killed in a railroad wreck at Ashtabula, O.

Bliss, PORTER CORNELIUS (1838–85), American journalist, the son of a missionary to the Indians, was born in Erie county, N. Y., and in 1861 accompanied James Watson Webb, minister to Brazil, to that country as secretary. He explored the Gran Chaco in Paraguay for the Argentine government, and assisted in writing a history thereof (1871, 2 vols.). A notable incident in his life was his arrest as a Brazilian spy during the war between that country and Paraguay. His release was demanded by the United States government. In 1870 he was secretary of legation in Mexico; and in 1874 he engaged in encyclopædia work in New York, and edited *The Library Table*, a weekly publication. He was the author of a history of the Russo-Turkish War of 1877.

Bliss, TASKER H. (1853), American soldier, was born in Lewisburg, Pa.; was graduated from the U. S. Military Academy in 1875; and was commissioned a second lieutenant in the artillery. He served as professor of military science at the Naval War College (1885–8); inspector of rifle practice (1888–95); chief of staff to Major-Gen. J. H. Wilson in the Porto Rican campaign (1898); and collector of customs, port of Havana (1898–1902), where he was instrumental in rehabilitating the customs service. He was a special commissioner to Cuba after the war, and arranged the treaty of reciprocity between that country and the United States.

In 1902 Bliss was appointed a brigadier-general, and was made a member of the Army War College Board. From 1905 to 1909 he was stationed in the Philippines as commander of various departments. In 1909 he became a member of the General Staff, and president of the Army War College; in 1910–11 commander of the Department of California, in 1911–13 of the Department of the East, and in 1913–15 of the Southern Department. In 1915 he was appointed assistant chief of staff, and the same year became a major-general. Shortly after the American declaration of war (April, 1917) General Bliss became Acting Chief of Staff; in September succeeded Gen. H. L. Scott as Chief of Staff; and one month later, when the grade of general was revived, was appointed to that grade with General Pershing. In January, 1918, it was announced that he had been appointed to represent the United States on the Supreme War Council of the Allies.

Blister, a vesicle caused by a deposition of serous fluid beneath the skin, in consequence of a burn, the application of a vesicant, or disease, or friction. The same name is given to the therapeutic medium by which the blister is produced. The color of a blister shows the nature of its contents, amber color indicating serum, opalescence pus, and red an admixture of blood. The treatment in general is to puncture, so as to allow the contents of the vesicle to escape slowly, and then to cover with boracic lint. Vesicants, or substances which cause blistering, are cantharides (q.v.), glacial acetic acid, liquor ammoniæ, liquor epispasticus or blistering fluid, and the cautery.

Blistering is the application of a vesicant near an inflamed part; it should not be directly over it, nor where the skin is loose, nor over any prominence of bone. The cantharidine of a blister may be absorbed and affect the kidneys injuriously, but this should be prevented by sprinkling powdered camphor over the blister before applying it to the skin. A blister left on too long may produce dangerous sloughing; six or eight hours are generally sufficient, when it should be replaced by a warm dressing or poultice. A blister should be opened by pricking the most dependent parts with a disinfected needle. The part should then be dressed with sterilized cotton wool or boracic lint. In the case of children, blisters must be used with special caution, being kept on only for an hour or until the skin is reddened, and then replaced by an aseptic poultice.

A blister first acts as a local stimulant; if kept on long enough it causes a large discharge of serum, and so acts as a depletive and depressing agent. A blister over the heart will stimulate its action. Blisters are of service in many brain affections that are attended with congestion, in pleurisy with effusion, in pericarditis, and in effusion in joints. In the acid vomiting of gouty patients a blister over the epigastrium may give relief, and some forms of neuralgia will yield to a vesicant over the seat of pain.

Blister Beetle, a popular name for a number of beetles in two distinct families, Meloidæ and Cantharidæ. The name refers to the vesicating or blister-raising properties of their body juice. The Spanish Fly and the Oil Beetle are familiar illustrations. As to the zoological characters of the family, the antennæ are usually eleven-jointed, the head depressed with a narrow neck, the front shield narrower than the flexible wing covers, the claws split into two usually unequal portions, the abdomen with six to seven free rings. The life history is often remarkable. The larvæ live parasitically on bees, on grasshopper or locust eggs, etc., and seem to pass through an unusual number of changes, to which the name 'hyper-metamorphosis' has been applied. It is not merely that the larvæ begin life lean, horny, and six-footed, and soon become fat, soft, and footless, but that before passing into the pupa stage they pass through a series of preparatory changes. The important genera are: (1) Lytta or Cantharis, (2) Mylabris, (3) Cercocoma, (4) Meloë. See CANTHARIDES.

Blitung. See BILLITON.

Blizzard, a fierce and blinding snow storm accompanied by high north winds and a rapid fall of temperature. The gale drives before it a fine, dry, icy snow, the flakes being virtually ice dust about one-twentieth of an inch in diameter. In severe blizzards the wind will blow at the rate of fifty miles an hour, with the thermometer at 62° below freezing point; and it has been known to blow for 100 consecutive hours at the rate of over forty miles an hour. No one can live in these winds for any length of time; the painful effect of the blast loaded with ice needles rouses a kind of frenzy, and many of those who have died from exposure have lost their senses completely before they have perished. Blizzards are most common in the Western States and Canada, but may extend as far east as New York and as far south as Texas.

In some districts blizzards are looked for three or four times in a winter; but really disastrous ones are rare—those of 1836, of December, 1863, January, 1866, and January, 1873, being, until 1888, the severest on record. In the blizzard which visited the Dakotas, Montana, Minnesota, Nebraska, Kansas, and Texas in January, 1888, the thermometer fell within twenty-four hours from 74° above zero to 28° below in some places, and in South Dakota went down to 40° below zero. In fine clear weather, with little or no warning, the sky darkened and was filled with snow or ice dust as fine as flour, driven before a wind so furious and roaring that men's voices were inaudible at a distance of six feet. Objects became invisible a few yards off. Farmers died in the fields before they could reach their houses, and children on their way from school; some of those who died having been suffocated, from the impossibility of breathing. Some 235 persons lost their lives.

In March, 1888, a severe blizzard afflicted the North Atlantic States, when snow fell to the depth of more than three feet, and was piled into drifts as high as twenty feet, causing a general suspension of traffic, and inflicting many hardships in the larger cities. The last mentioned is frequently alluded to as 'The Blizzard.'

The most recent blizzard occurred in November, 1913, when a fierce storm visited the region of the Great Lakes, the scene of greatest violence being Central Ohio and Lake Huron. For several days the city of Cleveland was brought to a practical standstill, traffic being interrupted by the snowfall, and most business suspended; while 250 lives and 10 ships were lost on Lake Huron.

The word, which seems to be akin to *blast, bluster*, first became usual throughout the United States during the severe winter of 1880–81, but was in colloquial use in the West early in the century. The U. S. Weather Bureau predicts and traces these storms. See STORM.

Bloch, CARL HENRIK (1834–90), a leading modern representative of Danish national painting. He studied at the Copenhagen Academy (of which he was appointed professor in 1871), and painted Zealand and Jutland peasant life—*e.g., The Dinner, The Fishermen's Home*—between 1854 and 1859. In Rome (1859–65) this many-sided artist painted the humorous side of monastic life, and became a historical painter. His chief works (*e.g., Christian II. a Prisoner in the Castle of Sonderburg*, and *Samson and the Philistines*) are in the gallery of the Royal Palace of Christiansborg at Copenhagen; while a fine piece, *The Deliverance of Prometheus*, went to Athens. He was also a fine etcher.

Bloch, JEAN DE (1836–1902), Polish banker and author, was born of Jewish parents, and was educated in Warsaw. He wrote, in Russian, *Influence of Railways on the Economic Condition of Russia* (5 vols.), *The Finances of Russia* (4 vols.), and in 1898 *The War of the Future* (6 vols.), of which part has been translated into English under the title *Is War Now Impossible?* (1899). The thesis of the last work, which has provoked considerable discussion, is that war between the great powers is no longer possible as the arbiter of international disputes. After analyzing present conditions of armament and defence he deduces that modern wars will be long wars, and must necessarily result in economic exhaustion, entailing starvation and the dislocation of the social fabric. At best they will result in a 'kind of stalemate,' with no decisive issue. Norman Angell develops the same theme, though on different grounds, in his *Great Illusion*. Bloch's pamphlet, *Lord Roberts' Campaign and Its Consequences*, suggested the blockhouse scheme which ultimately brought about the reduction of South Africa district by district.

Block, in the rigging of a ship, is part of the apparatus for raising sails and yards, tightening ropes, etc. The block comprises both the frame or shell, and the pulley or pulleys—usually termed 'sheaves'—contained within it. In nautical and mechanical language a *tackle* includes the rope as well as the block through which it works. A single block contains only one sheave, a double block, two; a treble block, three; and so on; while the term 'purchase block' is generally applied to all blocks having more than two sheaves. All the blocks on board ship have distinctive names—*e.g.*, *cat block, cheek block, clew garnet block, clew line block, boat block, snatch block*, etc. Ships' blocks are usually made of elm, and the sheaves of lignum vitæ. Blocks made wholly of iron are used about the decks of ships, but are ill adapted for use in ships' rigging, on account of the chafing and fraying entailed. See PULLEY.

Blockade, in a military sense, is an operation for capturing an enemy's town or fortress, often without a bombardment or regular siege. The attacking party throws up works on the neighboring heights and roads, so as to guard every exit from the town. The rest of the besieging force remains under cover, ready to repel any sortie. Fortresses on steep eminences, difficult to conquer by assault, may be reduced by blockade. Towns situated on a plain are less easily invested. The blockade of Paris by the Germans in 1870–71 is the most notable example of such an operation that has ever been known. It was of itself completely successful, and the bombardment which was thought necessary might have been dispensed with. At Metz, in the same campaign, a large and well-appointed army was compelled to surrender by a blockade without bombardment. (See SIEGE.)

Blockade, in a naval sense, is the prevention of the entrance or exit of the enemy's ships at a particular port, or at all the ports on a stretch of coast, excluding also, neutrals. For a valid blockade it is necessary that a state of war should exist; that the blockade be really effective—that is to say, it must be maintained by a force sufficient to prevent access to the enemy's port; and neutral nations must be informed by the blockading power. Effective blockade is the principle laid down in the Declaration of Paris (1856), but this is construed more rigidly by Continental nations than by England or the United States. Riga was effectively blockaded during the Crimean war at a distance of 120 miles. The blockading force may seize any vessel with its cargo trying to trade with the port, and send it home for condemnation; and if the vessel succeed in breaking the blockade, it may be pursued and captured by a belligerent, until it has reached its port of destination. That breach of blockade involves confiscation of the ship is admitted by all civilized nations. The cargo is not forfeited unless its owner is the owner of the ship, or was cognizant of the intended violation.

There are various rules in regard to blockade that have been adopted by common consent for convenience. A ship, for instance, is not liable to capture if, on arriving at the scene of blockade, her papers show that she began her voyage in ignorance of it, and was directed to make inquiry, and to proceed, if necessary, to an alternative destination. A vessel, further, for the sake of humanity, is allowed, if in danger or distress, to enter a blockaded port. If a neutral ship be in port when a blockade begins, she is given fifteen days for clearing. Mail steamers, on condition that no contraband of war is carried, are allowed in and out of a blockaded port. In the Mexican War, British mail boats ran in and out of Vera Cruz. Neutral men-of-war are by consent and custom, but not by right, allowed ingress and egress.

Napoleon's Berlin decree of 1806 declared the British Isles in a state of blockade (see CONTINENTAL SYSTEM). The most memorable of recent blockades is that of the ports of the Southern States by the Federal Government during the American Civil War. The blockade was begun in April, 1861. It extended from the Potomac to the Rio Grande, along the Atlantic Coast, and over the Gulf of Mexico, for a distance of 3,000 miles, and lasted four years. Considerable trade was carried on, however, by swift steamers through such blockaded ports as Charleston (the harbor of which was obstructed by sinking old ships and stones to assist the blockaders) and Wilmington. See CONTRABAND OF WAR; NEUTRALITY; PRIZE OF WAR. Consult Hobart Pasha's *Sketches from My Life;* T. S. Taylor's *Running the Blockade;* and as to the law, Twiss, Hall, Phillimore, Hazlitt, and Roche for England; Wheaton for the United States; Hautefeuille, Heffter, Gessner, and Bluntschli for the Continent of Europe.

Block Books, books printed from engraved wooden blocks, one block generally serving for an entire page. A large number of these were produced in Central Europe, chiefly in Germany, also in Holland, during the years that immediately preceded (say 1435 onward) the invention of typography, or printing from small movable types. Some of them consisted wholly of pictures; others contained explanatory text. It is not known with certainty whether a rude kind of press was used, or whether they were produced by rubbing the back of the paper as it lay on the block. Only one side of the paper was printed, two blank sides being afterward pasted together. See BIBLIA PAUPERUM.

Blockhouse, originally a detached fort blocking or covering the access to a landing, a narrow channel, a mountain pass, a bridge, or other strategical point. It may be constructed of timber, stone, or metal, and is loopholed and embrasured for rifle firing. In the later guerrilla stages of the South African War (1901–2) extensive use was made of a series of blockhouses by Lord Kitchener. Nearly 5,000 of them were built, from 2,000 to 3,000 yards apart, totally enclosing a large extent of country. They were constructed of sheets of corrugated iron 4 inches apart, filled in with stone ballast, and surrounded and connected by barbed wire.

Blocking Course, in masonry, a course of stones laid above a projecting cornice, in order that its weight may prevent the latter from falling, where the centre of gravity of the cornice is rather far forward.

Block Island (formerly MANISEES), an island forming part of Newport county and the town of New Shoreham (whose pop. in 1910 was 1,314), 10 miles south of the mainland of Rhode Island, some 8 miles in length, and varying from 2 to 5 miles in width. It is a popular summer resort. There is a small light on the northern extremity, and on the southeast a light of the first order visible for twenty miles. It was first visited by Adrian Block in 1614, and has afforded poets and romancers a fertile theme of wreck and piracy.

Blocksberg. See Brocken.

Block Signal System. See Railroads, *Block System.*

Blodget, Lorin (1823–1901), American physicist and statistician, was born near Jamestown, N. Y., and was graduated from Geneva (now Hobart) College. He joined the staff of the Smithsonian Institution in 1851, and was in the Government service until his resignation in 1877, with the exception of four years as editor of the Philadelphia *North American* (1859–63). His early papers on climatology had much to do with the establishment of that science in the United States. He published *Climatology of the United States and of the Temperate Latitudes of the North American Continent,* which received the commendation of Humboldt; also a number of volumes on finance and industry.

Bloemfontein, blo͞om′fon-tīn, capital of the Orange Free State, South African Union; 750 miles by rail northeast of Cape Town. It is pleasantly situated in the open veld at an elevation of 4,518 feet, and has a dry, healthy climate, which has given it some reputation as a health resort. The streets are well laid out; several stone bridges cross the Bloemspruit, which runs through the town. There are a number of fine buildings, notably the Raadzaal, former meeting place of the republican government, now occupied by the provincial council; the post and telegraph office, public library, museum, and Dutch Reformed and Anglican Churches. At a short distance from the town is Grey University College (1906–8).

Bloemfontein is the commercial centre of the province, and has a large trade in wool. During the South African War it was occupied by the British under Lord Roberts. Pop. (1911) 26-925, of whom 14,720 were white.

Blois, blwä, town, France, capital of the department of Loir-et-Cher, is situated on the right bank of the River Loire; 35 miles by rail southwest of Orleans. It is the seat of the famous château of the family of Orleans, a splendid Renaissance structure finely restored since 1845, which has been the scene of many interesting historical events. Louis XII. was born in it; under its roof Charles, Duc d'Alençon, and Margaret of Anjou, and Henry IV. and Margaret of Valois, were married; and here the Duc de Guise and his brother, the Cardinal, were murdered by order of Henry III. in 1588. The town is also the seat of the old abbey Church of St. Nicholas (1138–1210) and of the Cathedral of St. Louis, rebuilt after 1678. Vinegar, chocolate, earthenware, shoes, and furniture are manufactured, and there is trade in grain, wines, timber, and live stock. Pop. (1901) 23,785; (1911) 23-955.

Blok, Petrus Johannes (1855), Dutch historian, born at Helder. He was made professor of history at Groningen (1884) and at Leyden (1894); and has written: *Geschiedenis van het Nederlansche Volk* (8 vols. 1891–1907; Eng. trans.).

Blomfield, Charles James (1786–1857), bishop of London, was born at Bury St. Edmunds. He had a brilliant career at Trinity College, Cambridge, of which he was elected a fellow. Between 1810 and 1815 he published editions of several of the plays of Æschylus, an edition of Callimachus, and (in conjunction with Dr. Monk) the *Posthumous Tracts of Porson* (1812) and the *Adversaria Porsoni* (1814). Blomfield became rector of St. Botolph's, Bishopsgate (London), in 1819, bishop of Chester in 1824, and then bishop of London (1828–56). During his London episcopate more than two hundred churches were built, and he was also mainly instrumental in establishing the Colonial Bishoprics Fund. Consult his *Memoirs.*

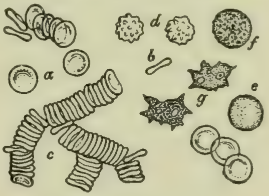
Blommaert, Philip (1808–71), Flemish author, born at Ghent. One of the chief revivers of the Flemish idiom, he edited its poetry of the twelfth to the fourteenth century, including *Theophilus* (1836; new ed. 1858), which bears some resemblance to *Faust,* and *Oudvlaemsche Gedichten* (1838–51). He also translated the *Nibelungenlied* into Flemish. *Aleoude Geschiedenis der Belgen* (1849) is marked by anti-French sentiment.

Blondel, famous minstrel of the twelfth century, a native of Nesle in Picardy; was the friend of his fellow minstrel, Richard Cœur de Lion, king of England. Richard, returning from the Holy Land, was captured by Leopold, duke of Austria, and thrown into the dungeon of Dürrenstein, where he was discovered by Blondel, whose song was answered by Richard from the tower. Speeding to England, Blondel arranged for the payment of the ransom which set Richard free. The earliest trace of this legend occurs in the *Chronicle of Rheims* (thirteenth century); no mention of it is found in Blondel's (Blondain's) acknowledged poems.

Blondin, Charles (1824–97), acrobat and tight-rope walker, whose real name was Jean François Gravelet, was born at St. Omer. He engaged in a tour through the United States; crossed the Niagara Falls many times on a tight rope, once blindfolded, once trundling a wheelbarrow, once carrying a man on his back. He settled in England during the last thirty years of his life. He considered his most difficult feat was walking from the main-mast to the mizzen on the steamship *Poonah* while on a voyage to Australia.

Blood, the red fluid which circulates through the heart, arteries, capillaries, and veins, supplying nutrition to all parts of the body, and conveying waste substances from the tissues to those organs by which they are excreted. In man and in all other mammalians, with the single exception of the camel in which the shape is elliptical, the red corpuscles are minute circular discs, biconcave and entirely devoid of any central kernel or nucleus. In all other vertebrate animals, including birds, reptiles, amphibians, and fishes, the red corpuscles are oval in shape, and contain a large central oval body.

Human blood is bright red in the arteries, dark in the veins, of an average specific gravity of 1.055, of a salt taste, faint odor, an alkaline reaction, and a temperature of 100° F. in the interior of the body, but lower in the extremities and on the surface. It holds in suspension large numbers of cells or corpuscles. The fluid itself is called the *plasma* or *liquor sanguinis.* The corpuscles are of two kinds—red and white. In a cubic millimetre of normal human blood there are five million red and ten thousand white corpuscles. The red give the color to normal blood; they contain a pigment, hæmoglobin, a complex proteid substance containing about 0.4 per cent. of iron. The red corpuscles are round discs $\frac{1}{3200}$ of an inch in diameter and $\frac{1}{12000}$ of an inch thick, and are of a light yellowish tint when seen under the microscope.



Blood Corpuscles.

a, Red corpuscle; *b*, the same in profile; *c*, red corpuscles in rouleaux; *d*, crenate red corpuscles; *e*, finely granular colorless corpuscle; *f*, coarsely granular; *g*, amœboid forms.

When freshly drawn blood is examined under the microscope, the red corpuscles are seen to run together, forming 'rouleaux.' The form of these red cells may be altered by various diseases — *e.g.*, pernicious anæmia; and another alteration due to disease is the appearance of nucleated forms of different size. The number of the red cells may also vary: the term *polycythæmia* is applied to those conditions in which the number of red cells is higher than normal, as contrasted with *oligocythæmia*, which means a decrease in number. The former condition arises when an animal is taken from a low to a high altitude; the latter is present in all forms of anæmia.

The white corpuscles, or *leucocytes*, though much less numerous than the red ones, have important functions. They are derived from lymph corpuscles, the cells of lymphatic glands, spleen, and pancreas; some of them, termed *phagocytes*, devour bacteria, dead or degenerate tissue, the products of inflammation, etc., and so have been called 'blood scavengers.' But they not only destroy what is effete; their normal secretions, especially those of the granular forms (for there are several kinds of leucocytes), have been shown to be essential to the economy of the body.

Other solid elements in the blood are *blood plates*, round bodies less than half the diameter of red corpuscles. They do not, as a rule, contain hæmoglobin, but are rich in phosphates and glycogen, and are supposed to aid in coagulation. Granular bodies also are found in blood: they are small, round, and highly refractive; seem to be derived from leucocytes, degenerating red cells and blood plates; and form precipitates in the blood plasma.

Chemical Composition.—In the red cells the main constituents are hæmoglobin (a globulin which coagulates at 167° F.), lecithin, cholesterin, and salts of potassium, sodium, iron, calcium, and magnesium. The most important salts are the chlorides and phosphates. There is about 70 per cent. of water. The *hæmoglobin*, which takes up oxygen in the lungs and carries it to all the tissues, is by far the most important constituent. The leucocytes are rich in a proteid 'nucleo-histin'; and the large proportionate quantity of phosphorus in the cells depends mainly on this substance and on lecithin. The number of leucocytes increases after a meal, and is proportionately larger in the pregnant, the newly born, and in those suffering from certain diseases. (See Leucocythæmia.)

Plasma and Serum.—While blood corpuscles and plasma form normal blood, clotted blood consists of clot and serum. The plasma is alkaline, yellowish in tint, of sp. gr. 1.026–1.029; 100 parts of plasma contain water 90.3, and solids 9.7. The characteristic proteids of serum are serum globulin, serum albumin, and fibrin ferment; those of the plasma are fibrinogen, serum globulin, and serum albumin. The gases of plasma and serum are small quantities of oxygen, nitrogen, and carbon dioxide.

The coagulation of blood may be observed in blood which has been drawn into an open vessel. In two or three minutes the surface of the fluid becomes semisolid or jelly like, and this change extends in eight or nine minutes throughout the mass. It is supposed that when blood is in the body it contains a globulin 'fibrinogen,' and that when it is shed the fibrinogen molecule is split up into a globulin which remains in solution, and 'fibrin ferment,' which does not exist in healthy blood, but is a product of the disintegration of the white corpuscles and blood plates produced when the blood leaves the vessels or comes in contact with foreign matter. Methods have been devised for estimating the total quantity of blood, the volume of the corpuscles and plasma, the specific gravity, and the alkalinity. The quantity of hæmoglobin is estimated by color tests, and the number of red corpuscles within a given volume is counted under the microscope in the hæmocytometer. The bacteriological examination of blood has yielded valuable results, as, for example, in 'Widal's reaction,' which is valuable in the diagnosis of typhoid fever. The recently discovered test of the opsonic index of the blood is an important aid in diagnosis and treatment.

See Anæmia; Blood Pressure; Blood Vessels; Circulation of the Blood; Chlorosis; Opsonic Index; Serum Therapy.

Consult Cabot's *Clinical Examination of the Blood;* Ewing's *Clinical Pathology of the Blood.*

Blood, Avenger of (Hebrew *goël haddam*), a title given to one who pursued a manslayer to avenge the death of his kinsman. Hebrew law stands between primitive custom, which puts the duty of avenging murder on the kindred of the murdered, and modern law, which puts it on the state. Thus it is the kinsman, not the state, who executes justice (Deut. xix. 12); but the manslayer can flee to the altar or the cities of refuge, and there lay his case before the elders (Josh. xx. 4 *f.*); in Num. xxxv. 24 *f.* the congregation decides between him and the *goël.* In this way a certain check was given to the blood feud. It is noteworthy that Hebrew law forbade compensation for murder (Num. xxxv. 31 *f.*), which the Koran allows.

Blood, Corruption of. See Attainder.

Blood, Thomas (*c.* 1618–80), English adventurer, usually styled 'Colonel' Blood. For his military services on the Parliamentary side he was rewarded with Irish estates, which he lost at the Restoration, but received again from Charles II. His most notorious exploits were the plot to surprise Dublin Castle and seize the lord-lieutenant, in 1663; the rescue of his friend Captain Mason from a guard of eight troopers near Doncaster; the attempt to abduct and hang the Duke of Ormonde, in 1670; and the theft of the crown jewels.

On May 9, 1671, Blood, disguised as a clergyman, with three accomplices entered the Tower to carry off the regalia. He actually succeeded in getting off with the crown under his cloak, while one of his associates bore away the orb. They were, however, overtaken, and imprisoned. King Charles visited the adventurer in prison, and, believing that there were hundreds of Blood's associates banded together by oath to avenge the death of any of the fraternity, pardoned him, took him to court, and restored him his estate of $2,500 a year. Consult Abbott's *Col. Thomas Blood* (1911).

Blood Feud, the right of private vengeance. In primitive society the protection and enforcement of one's rights are largely left to the individual or to the family or clan to which he belongs, and the first step toward the reign of law consists in the legal regulation of this self-help. Murder and other crimes of violence were accordingly punished with the sanction of the law by the family of the victim, but under certain guarantees of fair dealing and with some consideration for the rights of the criminal. In course of time a pecuniary composition, known as *blood money*, could be made for such a crime, the amount of the payment due depending upon the degree of the injured person and the nature of the crime. See Vendetta.

Blood Flower (*Hæmanthus*), a genus of Amaryllidaceæ, mostly natives of South Africa, some of which are common in greenhouses. They take their name from the usual color of their flowers, which form a fine head or crowded umbel. The species seem generally to possess poisonous properties. The inspissated juice of *H. toxicarius* is used in South Africa for poisoning arrows.

Bloodhound, an ancient breed of dog, remarkable for its exquisite powers of scent, and for the eagerness with which it tracks a bleeding animal. It is able to select a freshly wounded deer from among a herd, and follow its trail; and from this faculty it derives its name. The bloodhound was formerly common and much in use in Great Britain and on the continent of Europe for hunting purposes, being in the possession of most noble families, who vied with one another in the purity and excellence of their different strains. Bloodhounds were also much used to track escaped prisoners, and are mentioned in the poetical histories of Bruce and Wallace as being used by their enemies to discover them; and in later days they were resorted to by slave owners in America in the pursuit of fugitive slaves.

Bloodhound.

The bloodhound is a large tan-colored dog, with an exceedingly handsome and noble head expressing dignity and strength. The head should be long and narrow, with a dome-shaped skull, the occipital bone forming a peculiar peak on the back of the skull; the eyes distinctly showing the third eyelid or 'haw,' which gives the eye a bloodshot and rather fierce look; the ears long enough to meet in front of the nose, but falling down close on either side of the face; color, a rich tan with a dark saddle, showing no white if possible.

The bloodhound is rather unmanageable when thoroughly roused, on account of his courage and strength, but when properly treated is generally docile, and makes a capital watchdog. In recent years attempts have been frequently made by the police to track murderers by means of bloodhounds.

The *Cuban Bloodhound,* notorious as having been employed in the pursuit of felons and fugitive slaves in Cuba and the Southern States, differs largely from the true bloodhound, and is really the descendant of mastiffs with a bulldog cross, inferior to the real bloodhound in scent and all but ferocity.

Bloodletting. See Bleeding.

Blood Poisoning is a name loosely used of septicæmia, pyæmia, and allied diseases (see Septicæmia; Pyæmia). It is also used popularly in a wider sense for the results on the human system of poison germs from malaria, bad drains, etc.

Blood Pressure. The blood (see Blood) is under a certain degree of pressure which varies in different parts of the circulatory system. The heart propels the blood into the arteries. From the aorta, the main artery leaving the heart, branches go to all parts of the body. These branches break up into smaller and smaller divisions until they are of microscopic size, when they are called capillaries (q.v.). These join one another to constitute a new system of vessels, the veins (q.v.), which become progressively larger, and in them the blood is returned to the heart. The capillaries with their narrow lumina offer the maximal resistance to the flow of blood from the heart. As the result of these two forces, propulsion on the one hand, resistance on the other, the blood is under considerable pressure. It is the *arterial* blood pressure—that is, the tension of the blood between the heart and the capillaries—that is ordinarily indicated when we speak of 'blood pressure.' After the blood has passed through the capillaries into the veins, the pressure, known as the venous pressure, is considerably lower.

The earliest blood pressure observations were made in 1733 by the Rev. Dr. Stephen Hale. This scientist made his studies in a very simple manner. He connected various blood vessels with an upright glass tube. It was found that the blood from the arteries rose 8 feet and 3 inches in the tube, while that from the veins attained a height of only 12 inches. It is obvious that if blood pressure observations are to be made in routine physical examinations on human beings, other methods must be applied. The instruments in use to-day are very compact and simple. A rubber bag shaped like a cuff is strapped or bandaged loosely about the upper arm; by means of rubber tubing this bag is connected with a rubber bulb and an indicator. The rubber bulb, when compressed, pumps air into this closed circuit. The indicator is one of two types: either a pressure gauge much like that used on steam engines, or an upright glass tube whose lower end is connected with a small reservoir of mercury. When air is pumped into this system of tubes and the pressure within it rises, the needle of the gauge or the height attained by the column of mercury indicates the extent of the rise. When the arm band causes sufficient compression to result in a disappearance of the pulse at the wrist, the blood pressure reading is taken. It may also be found by listening over the arteries at the elbow with the aid of a stethoscope (q.v.), and observing the point at which a thumping sound disappears as the pressure in the cuff is raised and again reappears as it is lowered. Inasmuch as mercury is 13.5 times as heavy as blood, it has been used as a practical, compact standard for measuring the blood pressure. It has been found convenient to think of blood pressure in terms of millimetres of mercury, instead of the height of a column of blood in feet and inches.

In normal individuals, the blood pressure varies somewhat with age, increasing slightly with advancing years. According to J. W. Fisher's statistics, from 19,339 accepted candidates for life insurance, it appears that between the ages of 15 and 20 years the average blood pressure is 120 millimetres of mercury, while from 56 to 60 it is 135. The intervening ages show corresponding gradations. The blood pressure is not constant in healthy individuals, but has a tendency to rise moderately with physical exercise or marked nervous tension, and to fall with rest or sleep.

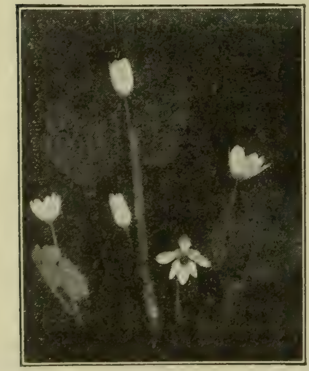
Certain diseases are characterized by an increase in blood pressure. These are notably two: Bright's disease (or nephritis) and essential hypertension (a morbid condition characterized in its early stages by increased blood pressure and no other changes). The cause of the increased blood pressure or hypertension in these conditions is a debated matter. The most plausible theory advanced heretofore is that the body elaborates some chemical substance which stimulates the muscular walls of the arteries to contract. When their calibre is reduced, they offer an increased resistance to the flow of blood, and hypertension results. No one has yet succeeded in isolating this hypothetical chemical substance.

The heightened blood pressure is likely to cause certain secondary changes in the heart and blood vessels that may entail serious consequences. However, by moderation in physical and mental efforts, these effects may in large part be held in abeyance.

Thus, Sir Clifford Allbutt reports a case of hypertension lasting for eighteen years, the patient finally succumbing to old age. A diminished blood pressure, hypotension, has up to the present time been found of very little significance in clinical medicine.

Blood Rain, which doubtless has its origin in the uprushing currents of waterspouts and whirlwinds, has frequently fallen in Italy and Southern Europe, and has been repeatedly traced to microscopic dust, of a brick-red color, borne high into the air from the sandy deserts of North Africa adjoining. Similar rains have fallen in the Canaries, and they may be likewise ascribed to the African desert to the eastward. In these cases the origin is the rainless whirlwinds, which are locally called 'devils.'

Bloodroot (*Sanguinaria canadensis*), a perennial herb of the poppy family (Papaveraceæ), native to Eastern North America, where it is found in colonies in rich, open woods on low, rocky hillsides. It blossoms in early spring, bearing a single white star-like flower at the end of a naked scape, enfolded while in bud in a single large, lobed leaf. The blossom is from one to one and a half inches across, has from eight to twelve petals, and two sepals, which fall as soon as the flower unfolds. The horizontal root stock is thick and fleshy, and both root stock and stem, when bruised, exude a blood red sap in copious quantities. This sap was used by the aborigines as a paint for their flesh and as a scarlet dye, whence the plant is also known as Red Indian Paint and Red Puccoon.



Bloodroot
(*Sanguinaria canadensis*).

Various species of the Hæmodoraceæ (q.v.) are also known as bloodroot.

Blood Stains include both discolorations due to the contact of blood with an absorbent material, as linen and other fabrics, and the residue of blood left after evaporation on non-absorbent surfaces, as polished wood and metals. They vary in color with age, the nature of the material stained, and the degree of exposure to the air. The detection of blood stains is of the utmost importance in medicolegal investigations. The methods of determining the origin of suspected stains are of four types — chemical, spectroscopic, microscopic, and biological or serological.

Chemical Tests.—The chemical reactions of blood are very definite. In the first place, all blood stains are soluble, making possible at once the exclusion of insoluble stains, as paint and iron mould. In the second place, ammonia produces no change of color in blood, but turns to a greenish tint certain other soluble stains, as those due to fruits and vegetables.

In addition to these negative tests there are a number of positive chemical tests having to do chiefly with the presence of hæmoglobin, the principal component of the red blood corpuscles, and the one to which they owe their color. For *Teichmann's test* a bit of the stained fabric is moistened with a drop of water containing a minute crystal of common salt, and evaporated to dryness. The residue is treated with glacial acetic acid, reheated, cooled, and examined microscopically for crystals of hæmin, the occurrence of which is a sure proof of the presence of blood.

Where the suspected stain has been partially obliterated by washing, the *sodium tungstate test* is valuable. A solution of the stain is filtered, and the filtrate acidified with acetic acid and treated with a saturated solution of tungstate of sodium similarly acidified. On heating, dense chocolate-colored masses are produced, which may then be subjected to Teichmann's test.

In the *guaiacum test* a few drops of a freshly prepared spirituous solution of guaiacum are placed on the stain, and a small proportion of hydrogen peroxide applied. If no color change occurs, the stain is not due to blood. If blood is present a sapphire blue is produced. As a similar change takes place with certain other substances, the test is most valuable when it yields a negative reaction.

Spectroscopic Test.—The stained portion of cloth or of the suspected blood clot is digested in distilled water, and the resulting liquid placed in a deep narrow cell and examined by a spectroscopic eye piece with a low power of the microscope. The spectrum of oxyhæmoglobin is characterized by the presence of two dark absorption bands between the lines D and E. If the blood has passed, by exposure to the air, from the condition of oxyhæmoglobin to methæmoglobin, the spectrum will show in addition two other absorption bands — one in the red orange between C and D, and one to their right faintly defined in the green between E and F. (See Spectrum and Spectroscope.)

Microscopic Test.—In some cases blood corpuscles can be recovered from a stain in a comparatively uninjured condition by soaking or washing the stained material or dissolving a portion of the clotted blood in a normal salt solution. If blood cells thus removed are examined under the microscope, their form and measurements will determine whether they belong to mammalian blood.

The *Biological* or *Serological Test* makes it possible to distinguish definitely between human blood and that of other animals (except *Simiidæ*). It depends upon the fact that if an animal A be inoculated with the blood or serum of a second animal B of another species, and the blood of A be then added to that of an animal of a similar species to B, a definite reaction is set up. In medico-legal practice suspected stains are dissolved, diluted in salt solution, and treated with a certain proportion of humanized rabbit serum.

See Blood. Consult Sutherland's *Blood Stains* (1907).

Bloodstone, Heliotrope, or St. Stephen's Stone, names given to a variety of chalcedony or plasma, distinguished by the presence of a dark green ground of blood red spots, apparently due to red oxide of iron. It has been much used for rings and brooches, those varieties being most valued in which the red spots are bright, well defined, not too irregularly scattered, and contrast well with the dark green color of the body of the stone. It is found in Iceland, the Hebrides, and in larger quantities in India and Australia.

Blood Transfusion. See Transfusion.

Blood Vessels, a general term applied to all the canals through which the blood circulates, including the arteries, veins, and capillaries. See Artery; Blood; Capillaries; Circulation of the Blood; Veins.

Bloodworms are the aquatic larvæ of gnats, belonging to the genus of Chironomus (see Midges). They are long, slender, worm-like creatures, which contain the red blood pigment hæmoglobin, and do not at first possess the ordinary tracheal system of insects. They occur in stagnant water.

Bloody Assize, name given to the treason trials conducted by Lord Chief Justice Jeffreys of England after Monmouth's rebellion in 1685. See JEFFREYS OF WEM.

Bloody Mary. See MARY I.

Bloomer, AMELIA JENKS (1818-94), American reformer, was born in Homer, N. Y. She taught school from 1837 to 1840, when she was married to Dexter C. Bloomer of Seneca Falls, N. Y., a lawyer and newspaper man of that place. From 1849 to 1855 she published *The Lily*, a semi-monthly periodical devoted to temperance and woman's rights. The particular costume for women associated with her name was first advocated by her in this paper in 1851. It consisted of a jacket with close sleeves, a skirt falling a little below the knee, and a pair of Turkish trousers. The fashion was adopted by a few women at the time, but was ridiculed and soon discarded.

Bloomer Costume. See BLOOMER, A. J.

Bloom'ery, BLOOMARY, the first forge through which iron passes after it has been melted from the ore, and where it is made into *blooms*. See IRON.

Bloom'field, town, Indiana, county seat of Greene county, on the West Fork of White River, and on the Illinois Central, and the Chicago, Indianapolis and Louisville Railroads; 44 miles southeast of Terre Haute. It has flour and lumber mills, and manufactures of steel, iron, wood, and clay articles. There is trade in coal, lumber, live-stock, and agricultural products. Pop. (1900) 1,588; (1910) 2,069; (1920) 1,872.

Bloomfield, city, Iowa, county seat of Davis county, on the Chicago, Burlington and Quincy, and the Wabash Railroads; 70 miles northwest of Keokuk. Public buildings include a new $180,000 high school. Trade in grain and live-stock is carried on. Pop. (1900) 2,105; (1910) 2,028; (1920) 2,064.

Bloomfield, town, New Jersey, Essex county, on the Erie, and the Delaware, Lackawanna, and Western Railroads; 12 miles northwest of New York. It is the seat of the German Theological Seminary, Jarvie Memorial Library, and the Job Haines Home for Aged People. The First Presbyterian Church was built in 1797. According to the Federal Census of Manufactures for 1919, Bloomfield has 59 industrial establishments, with $23,962,713 capital, and products valued at $25,245,436. Woollen and rubber goods, safety pins, electric elevators, hats, paper, cream separators, cod liver oil, and incandescent lamps are manufactured. Settled between 1670 and 1675, Bloomfield was a part of Newark until its incorporation as a township in 1812. Pop. (1900) 9,668; (1910) 15,070; (1920) 22,019.

Bloomfield, MAURICE (1855-), American philologist and Orientalist, was born in Bielitz, Austria, and was brought as a child to the United States. He studied at the University of Chicago (1871-4), was graduated from Furman University, S. C. (1877), and studied Sanskrit and comparative philology with Professor Whitney at Yale, and at Johns Hopkins University (PH.D., 1879), completing his education at Berlin and Leipzig. He has been professor of Sanskrit and comparative philology at Johns Hopkins since 1881. He is a fellow of the American Academy of Arts and Sciences, and in 1908 received the Hardy Prize from the Royal Academy of Sciences at Munich.

Professor Bloomfield's translations and editions of Sanskrit writings and his contributions to philological literature are numerous and important. He edited for the first time from original manuscript the *Sūtra* of Kauçika and the *Grihyasamgraha* of Gobhilaputra, and translated the *Atharva Veda*. He has written: *The Atharva Veda* (1899); *Cerberus, the Dog of Hades* (1905); *A Vedic Concordance* (1906); *The Religion of the Veda* (1908); *Rig-Veda Repetitions* (2 vols., 1916).

Bloomfield, ROBERT (1766-1823), English poet, was born in Suffolk, was first an agricultural laborer, and then a shoemaker in London. During a short residence in the country in 1786 he conceived the idea of his poem *The Farmer's Boy*, written under melancholy circumstances in a London garret, and published in 1800. It is an estimable though much overpraised work, and was so successful that nearly 26,000 copies were sold in three years. He died in poverty and mental darkness.

Bloomfield-Zeisler, blo͞om'-fēld-tsīs'ler, FANNY (1866-), American pianist, was born in Bielitz, Austria, and was brought in infancy to the United States, where she made her home in Chicago. She received her instruction chiefly under Leschetizky in Vienna, and began playing in public in 1883. Two years later she was married to Sigmund Zeisler, a prominent lawyer of Chicago, Ill. She has played in all the principal American cities, and has toured in Germany, England, Austria, and France.

Bloom'ington, city, Illinois, county seat of McLean county, on the Illinois Central, the Lake Erie and Western, the Chicago and Alton, the Cleveland, Cincinnati, Chicago, and St. Louis, and the Illinois Central Railroads; 60 miles northeast of Springfield. It has a number of fine public buildings, including the Court House of Illinois marble, City Hall, and public library, several hospitals and sanitariums, and a Soldiers' Monument. The Illinois Wesleyan University is situated here, and the State Normal University is two miles away, at Normal (q. v.).

Bloomington is an important railroad centre, and is the seat of the car works and repair shops of the Chicago and Alton Railroad. Its pork packing and canning industries are important; stoves, machine shop and foundry products, brick and tiles, flour, and agricultural machinery are manufactured. In 1919 there were 83 industrial establishments, with $7,830,947 capital, and products valued at $11,519,580. Coal is mined. The town was settled in 1831. Pop. (1900) 23,280; (1910) 25,768; (1920) 28,725.

Bloom'ington, city, Indiana, county seat of Monroe county, on the Chicago, Indianapolis and Louisville, and the Illinois Central Railroads; 50 miles southwest of Indianapolis. It is the seat of Indiana University (q. v.), with grounds and buildings valued at $1,300,000. Manufactures include furniture, flour, harness, gloves, baskets, furniture polish, wax products, and mirror plating. Limestone is quarried near by. Pop. (1900) 6,460; (1910) 8,838; (1920) 11,595.

Blooms'burg, town, Pennsylvania, county seat of Columbia county, on the North Branch of the Susquehanna River, and on the Delaware, Lackawanna and Western, the Philadelphia and Reading, and the Bloomsburg and Sullivan Railroads; 40 miles southwest of Wilkes-Barre. It is the seat of the Bloomsburg State Normal School. It is located in a rich coal and iron district, and has blast furnaces, foundries, car works, and manufactures of furniture, carpets, woollen goods, silk, flour, fountain pens, matches and carriages. Pop. (1910) 7,413; (1920) 7,819.

Blossburg, borough, Pennsylvania, Tioga county, on the Tioga River and the Erie Railroad; 70 miles northwest of Wilkes-Barre. It is on Williamson Road, a direct highway from Harrisville to Buffalo, New

York. There are coal mines and quantities of undeveloped high-test clay for bricks in the vicinity. Pop. (1900) 2,423; (1910) 2,303; (1920) 2,033.

Blossom, Henry Martyn, Jr. (1866–1919), American writer, was born in St. Louis, Mo. He was educated at the Stoddard School and Washington University, St. Louis, and engaged for some time in the insurance business. He is the author of several novels—*The Documents in Evidence*, *Checkers*, *A Hard Luck Story*, and *The Brother of Chuck McGann;* and of the following plays and musical comedies: *Checkers; The Yankee Consul; Mlle. Modiste; The Prima Donna; The Red Mill; Miss Philura; The Slim Princess; All for the Ladies; The Man from Cook's; The Only Girl; The Princess Pat; Eileen.*

Blouet, Paul. See Max O'Rell.

Blount, blunt, James H. (1837–1903), American legislator, was born in Macon, Ga. He became a lawyer; served in the Confederate army during the Civil War; and was a member of Congress from 1872 to 1893. When in 1893 the Hawaiian monarchy was overthrown and an American protectorate established by U. S. Minister Stevens without authority, Blount was appointed by President Cleveland his paramount commissioner to investigate the affair. On the conclusion of his task he was for a short time American minister at Honolulu.

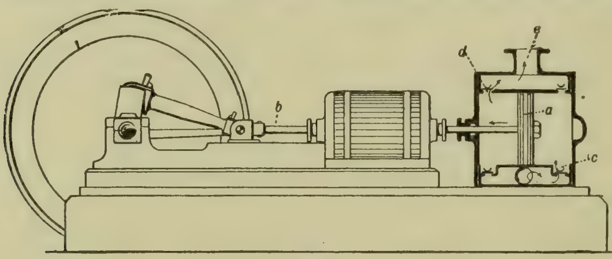


Fig. 1

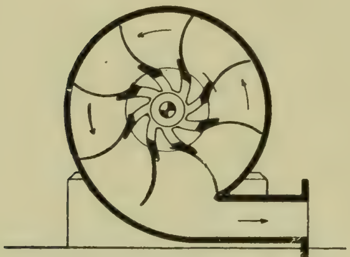


Fig. 2

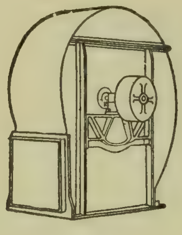


Fig. 3

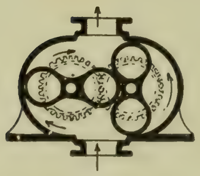


Fig. 4

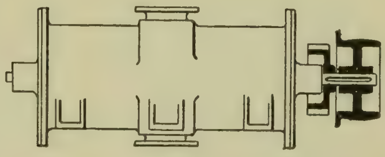


Fig. 5

Blowing Machines

Fig. 1. Blowing cylinder: *a.* piston; *b.* piston rod of steam engine; *c.* air inlet valve; *d.* outlet valve; *e.* blast main. Fig. 2. Centrifugal fan, side elevation (section). Fig. 3. Elevation of bottom horizontal discharge centrifugal fan. Fig. 4. Roots' rotary blower (section). Fig. 5. Roots' rotary blower, elevation.

Blount, William (1749–1800); American public official, was born in Bertie county, N.C. He served in the North Carolina legislature, was a delegate to the Continental Congress in 1783–4 and 1786–7, and a member of the convention which framed the Federal Constitution in 1787. In 1790 he became governor of 'The Territory of the United States South of the Ohio,' and upon the admission of Tennessee to the Union was elected U. S. Senator (1796). In 1797, having been accused of implication in a conspiracy to seize the Spanish possessions of New Orleans and the Floridas, and transfer them to Great Britain, he was expelled from the Senate. At his trial (1799), however, the court dismissed the impeachment on the ground of lack of jurisdiction, Blount being no longer a Senator. He was subsequently elected to the State senate of Tennessee, of which he became speaker.

Blouse, blouz, primarily a loose, sack-like outer garment such as is worn by the French workingman, the Russian peasant, and the British farm laborer (see Smock); by an extension of meaning any loosely fitting upper garment, as a shirtwaist or middy-blouse.

Blow, John (1678–1708), English composer, was probably born in Nottinghamshire. He was appointed successively organist of Westminster Abbey (1669); master of the children (1674) and organist (1676) at the Chapel Royal; composer in ordinary to James ii. (1685); almoner and master of choristers at St. Paul's (1687); and composer at the Chapel Royal (1699). He wrote numerous odes, anthems, and services, and published a collection of songs under the title *Amphion Anglicus.*

Blow, Susan Elizabeth (1843–1916), American educator, was born in St. Louis, Mo. She went to Germany and studied the kindergartens there, and returned to the United States a staunch disciple of Froebel. In 1873 she offered her services to the St. Louis Board of Education, undertaking to pay all the expenses and provide the equipment of a kindergarten school if the city would permit her the use of a schoolroom for one year. The experiment was markedly successful, and the training school later organized under her direction became the centre of influence in the new movement. She published: *Symbolic Education* (1894); *The Mottoes and Commentaries of Friedrich Froebel's Mother Play* (1896); *Letters to a Mother on the Philosophy of Froebel* (1899); *Educational Issues in the Kindergarten* (1908).

Blow-fly. See Blue-bottle.

Blow'gun, a weapon employed by certain tribes of North American Indians, consisting of a long hollow tube of cane or wood from which slender darts are expelled by blowing with the mouth. Blowguns are also used by certain natives of South America and by the East Indian Malays.

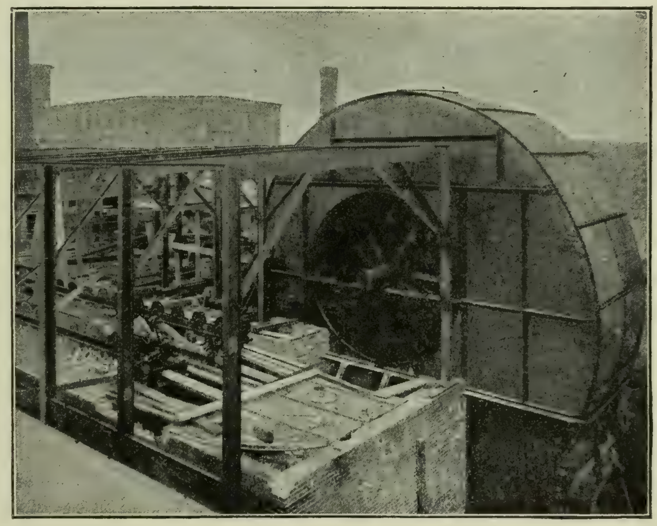
Blowing Machines, mechanical contrivances for the production of a current of compressed air. Their use is as varied as their form, but they are chiefly employed to produce the blast for metallurgical and forced draught for boiler furnaces, to displace vitiated air in close and foul places, to supply warmed, cooled, or purified air to public buildings, and to furnish a drying current of air to lumber, grain, fabrics, brick and other articles, or to remove steam, dust, and refuse from factories. The most elementary blowing machine is the common bellows of domestic use, which was also used from time immemorial for metallurgy, until the blowing cylinder with reciprocating piston was devised.

A modern blowing cylinder (Fig. 1) is fitted with a piston usually coupled direct to the reciprocating piston of the steam-engine. Both horizontal and vertical types are used. Air is drawn into one end of the cylinder through a flap-valve in the cylinder cover while the piston makes its out-stroke, and at the same time the air at the other side of the piston, drawn in at the previous in-stroke, is expelled under pressure through a flap-valve at the other end of the cylinder into the blast main. Blowing cylinders worked by direct-acting steam-engines are now in general use to produce a blast in furnaces. Blowing engines, as they are called, pump large quantities of air against comparatively low pressures; in blast furnace practice 15 to 30 lbs. per square inch is common, and in Bessemer steel work 25 to 30 lbs. per square inch.

They are equally well adapted for supplying large amounts of air or gas under pressure for other purposes, such as is required by chemical works and smelting furnaces, and for pumping and compressing natural and artificial gases. For low pressures and large volumes of air, fans and rotary blowers are preferred.

The centrifugal fan or fan blower, as an apparatus for producing draft for ventilation, dates back to the sixteenth century, but the application of the fan to accelerate combustion is much more recent. Two types of fans exist: The first, known as the disc or propeller wheel, is constructed on the order of the screw propeller and moves the air in lines parallel to its axis, the blades acting upon the principle of the inclined plane. The second, or fan blower proper, consists in its simplest form of a number of blades extending radially from the axis and presenting practically flat surfaces. By the action of the wheel the air is drawn in axially at the centre and delivered from the tips in a tangential direction. This type is designated as a centrifugal fan, or, more properly, as a peripheral discharge fan. The propellor or disc fan, which is available for ventilating purposes, when it acts against slight resistances is practically useless as a means of draft production. This can be secured by the use of the peripheral discharge type, which is usually enclosed in a case of such shape as to provide free movement for the air as it escapes at the periphery and an outlet through which it is all delivered. Figs. 2 and 3 illustrate a Green Matteawan Steel Plate Fan of this type.

Fans are known as blowers or exhausters, owing to the duty which they perform. The normal use of a blower being to force air into a given space while the exhauster is employed to remove air from an enclosure. For convenience of adjustment of pipe connections an exhauster is provided with an inlet on one side only, while a blower being exempt from these requirements is provided with two inlets, one upon either side. When pressures exceeding six inches of water are required, Roots's rotary blower (Figs. 4, 5) may be employed. It consists of a casing in which two 'rollers,' shaped like the figure 8, are centred on parallel axes, and are driven by a pair of equal spur-wheels in opposite directions at about 300 revolutions per minute. The rollers and casing have very little clearance, and the air is really scraped out of the casing on one side and delivered on the other.



Green Mechanical Draft Fan.

Installed to take gases from a Green Fuel Economizer. The gases are discharged to the chimney through a horizontal flue under the Economizer.

Blowitz, HENRI GEORGES STEPHEN ADOLPHE OPPER DE (1825–1903), who won a European reputation as Paris correspondent of the *Times* during a period of thirty years, was born at the château of Blowsky, in Bohemia, and baptized a Catholic. He was at first a teacher, but later took to politics. On the establishment of the republic in 1870 he obtained letters of naturalization. He supplied Thiers with information which enabled him to crush the commune in the south of France. As a reward he was nominated for the post of consul at Riga. He was appointed chief correspondent of the *Times* in 1873, and on Dec. 31 he telegraphed particulars of the *coup d'état* in Spain, which he had obtained by actually interviewing in Paris the newly-proclaimed king, Alfonso XII. Two years later he exposed the designs of the military party in Germany for a fresh attack on France, and war was averted. He obtained a copy of the treaty agreed to at the Berlin Congress in 1878, and telegraphed its preamble and sixty-four articles to the *Times* before it was actually signed. The name of the plenipotentiary who gave him the treaty has never been divulged. It was Blowitz who first announced that the Russians were going to Merv. The news was contradicted by the Russian government, but the prophecy was realized within six months. During his connection with the *Times* he interviewed

Bismarck, King Humbert, Pope Leo XIII., the Sultan of Turkey, and the Shah of Persia, among many notabilities. His *Memoirs* were published in 1903.

Blowpipe, an instrument used by glass-blowers, in analytical chemistry, and in the soldering of metals, for directing and increasing the rapidity of combustion of a flame. In its simplest form it consists of a tapered metal tube fitted with a mouthpiece; from the side projects a narrow tube provided with a nozzle of brass or platinum. By holding the point of the side tube into a candle, alcohol lamp or gas flame, and blowing a gentle current of air from the mouth, the flame is deflected, and an intensely hot, pointed jet is obtained. Larger blowpipes are made in various patterns, the air being supplied from a foot bellows, and the supply of gas and air regulated by taps. See Cornwall, *Manual of Blowpipe Analysis* (1891); C. F. Plattner's *Blowpipe Analysis* (1875); W. A. Shenstone's *Methods of Glass-blowing* (2nd ed. 1888).

Bloxwich, eccles. par. and vil., Staffordshire, England, 3 m. N.W. of Walsall. In the vicinity are coal and ironstone mines and blast-furnaces. Pop. of par. (1911) 23,190.

Blücher, GEBHARD LEBERECHT VON (1742-1819), field-marshal of Prussia, was born at Rostock, and entered first the Swedish service, then the Prussian (1760). In 1772 he left the army and farmed his own lands until the accession of William II. (1787). After being present in many actions (*e.g.* Kaiserslautern) against the French, he commanded the cavalry at Auerstädt in 1806, and was compelled to surrender after the fall of Lübeck (1806), but was soon after exchanged for the French general Victor. In 1813 Blücher received the chief command in Silesia, operating against the French at the battles of Lützen, Bautzen, and Haynau. He defeated Marshal Macdonald at the Katzbach in Aug., 1813, Marmont at Möckern (Oct. 16), and three days later made his victorious entry into Leipzig and was raised to the rank of field-marshal. In Jan., 1814, he crossed the Rhine and won the battle of La Rothière, but was soon afterward defeated by Napoleon. This reverse, however, was quickly wiped out by his victory over Napoleon at Laon on March 9; and after again inflicting a severe defeat on the French at Montmartre, he marched in triumph into Paris. He was made Prince of Wahlstadt by Frederick William III. for his victory at Katzbach. After Napoleon's return from Elba in 1815, Blücher was appointed commander-in-chief of the Prussian army. At Ligny, on June 16, he was defeated after a stubborn action; but he rallied his scattered troops, and moved to the assistance of Wellington at Waterloo. This impending flank attack on the French contributed greatly to the completeness of Wellington's victory, and Blücher was in time to participate in the pursuit. On the second taking of Paris, Wellington had great difficulty in preventing Blücher from sacking the capital, which the latter held to be a justifiable retaliation for the sacking of other capitals by the French. In Blücher's honor Frederick William III. created the order of the Iron Cross; and Rauch's noble statue of the veteran was erected (1820) at Breslau. Blücher's intrepidity and warlike fervor gained him the appellation of 'Marshal Vorwärts' (Go ahead), but he was not a great military strategist or tactician. He was characterized by patriotism, loyalty, and integrity, and by uncompromising hostility to Napoleon. Although rough in manner, he was idolized by his troops. He died at his estate in Silesia. See *Lives*, by Förster (1821; new ed. 1887), Scherr (1865), Varnhagen von Ense (in vol. iii. of *Biographische Denkmale*, 1872); also the various histories of the Waterloo campaign, and Chesney, *Waterloo Lectures* (1874).

Blue. The blue pigments and dyes in most general use are ultramarine, cobalt blue, indigo, and Prussian blue, in addition to the large number of compounds made from coal-tar products. Laundry blue is made of ultramarine, 60 parts; bicarbonate of soda, 40 parts; glucose, 12 parts. Grind the two first together, mix in the glucose, and press in moulds. Liquid laundry blue may be made as follows:—Indigo or Prussian blue, 8 lbs.; oxalic acid, 1 lb.; water, 32 gallons.

Blueback, the salmon of the Fraser River and its neighborhood (*Oncorhynchus nerka*), one of the most valuable of the Pacific salmons (q.v.). Its upper part is in spring distinctly bluish.

Bluebeard, hero of the fairy tale, and type of savage husbands. The English version is a rendering of Perrault's *Barbe-Bleue* (in his *Contes*, 1697). Bluebeard is the subject of an *opéra bouffe* by Offenbach (1866). See Wilson's *Bluebeard: A Contribution to History and Folklore* (1899).

Bluebell, a name applied to various plants—the wild hyacinth (*Scilla nutans*), which flowers in European woods in spring; to the several species of Campanula having nodding flowers, and particularly to the harebell (*Campanula rotundifolia*), which flowers during summer on hills. The latter is the 'bluebell of Scotland.'

Bluebird (*Sialia Wilsoni*), a common N. American bird belonging to the thrush family, and beloved of every one as a 'harbinger of spring.' It is prevailing sky-blue above, with a brownish breast; but in western species the breast is white. It comes familiarly into gardens and orchards, nests in holes in trees, or often in boxes placed in trees and the like for its accommodation, and lays 5 white eggs. It is migratory, arriving early in the spring, and saluting us with a soft and melodious warble. It is the nearest American approach to the English robin-redbreast. The name is also applied to the Indian *Irena puella*, a member of the family Pycnonotidæ. See John Burroughs's *Wake Robin* (1871).

Blue Books, official reports of the British Parliament and the Privy Council, usually bound in blue paper covers, containing the votes and proceedings of the house, bills at their successive stages, annual estimates for the public service, accounts of the expenditure of the previous year's votes, documents tabled by the ministry voluntarily or on demand of the house, reports of government commissions, annual reports of governors of colonies and consuls, etc. The printing of the proceedings of the house dates from 1681, and the selling of its blue books from 1836. In imitation of the blue book, Germany has established its gray or white book, first communicated (1884) to the Imperial Parliament. In France, the corresponding color is yellow; in Spain and Austria, red; in Italy, green; and in the United States both blue and red.

Blue-bottle, BLOW-FLY or FLESH-FLY (*Calliphora Erythrocephala*), an insect nearly related to the common house fly, but differing in its larger size, its bright blue abdomen, and its deep humming note. The eggs are laid in meat, especially if putrefaction has commenced—the flies being strongly attracted by decomposing matter of any kind—and hatch into maggots, which pass through the life-history usual for flies. Its maggots are called 'gentles' by anglers, and used as bait. The species mentioned has become almost cosmopolitan, but several others more local exist in various parts of the world. See Osborn's *Insects Affecting Domestic Animals* (1896).

Blue-coat School. See CHRIST'S HOSPITAL.

Blue Earth City, tn., Minn., co. seat of Faribault co., 46 m. S. by W. of Mankato, on the Blue Earth R. and on the Chi., St. Paul, Minn. and Omaha R. R. It has lumber and flour mills. Pop. (1910) 2,319.

Bluefields, or BLEWFIELDS, riv. and tn., Nicaragua, Central America. The river has a course of about 100 m., and is navigable for 60 m. The harbor of bluefields is one of the finest in Central America. Pop. about 5,000.

Blue-fish (*Temnodon saltator*), also called 'skip-jack,' is a widely-distributed fish belonging to the family of the horse-mackerels. It is especially common on the coasts of N. America, where it is much used as food, and in summer, when it appears close inshore, feeding upon menhaden, mackerel and other fishes; it offers excellent sport with rod and reel, or by trolling from a boat. It may attain a length of three feet, but is usually less, and is a most rapacious fish. Its flesh is highly prized as delicate food.

Blue-gowns, or KING'S BEDESMEN, public almsmen in Scotland to whom the kings distributed bounty, in return for which they were expected to pray for the welfare of king and state. The appointment of blue-gowns ceased in 1833, and the last allowance to a blue-gown was made in 1863. See Introduction to Scott's *Antiquary.*

Blue Grass. Certain species of the genus of grasses Poa, having bluish-green foliage, and panicles of bloom. The famous Kentucky blue-grass (*Poa pratensis*), which has given its name to the 'blue-grass' region of Kentucky, notable for its horses, is a favorite grass for pasture and lawn, and is widely cultivated for hay. It is known also as June-grass, and smooth-stalked meadow grass, and is found in Europe and Asia.

Blue Island, city, Cook co., Ill., a suburb S. of Chicago, on the Calumet R., and on the Chi., R. I. and Pac., the Ill. Cent. and other R. Rs. It has smelters, brickyards, quarries, etc. Pop. (1910) 8,043.

Blue Laws, any laws, especially sumptuary, characterized by extreme rigor and severity; particularly, in popular usage, the laws which were supposed to have been in force in the colony of New Haven, a collection of which was published by Samuel Peters in his *General History of Connecticut* (1781). It was long believed that this code was fabricated by Peters and that no such laws were ever really enacted, but it is now known that most of them did appear at one time or another in the statute books of some one or more of the colonies of New England, or were taken from an earlier writer, Neal. Several of the laws, however, and the most extreme and puritanical of the collection seem to have been invented by Peters. At all events the code was not what it purported to be, a collection of the laws of the New Haven Colony. See a monograph 'Examination of Peters's Blue Laws' by Prince in *Annual Report of the American Historical Association for* 1898 (1899), and Trumbull, *Blue Laws of Connecticut and New Haven;* and *The False Blue Laws invented by Samuel Peters* (1876).

Blue Mountains. (1.) Well-wooded (chiefly with eucalyptus) range in New South Wales, extending from the Warragong Mts. (Australian Alps) on the S.W. to the Liverpool Range on the N., approaching to within 40 m. of the coast. A few spurs run down to the shore. Average alt. 3,000 ft. (2.) Mountain group in Oregon, trending nearly N. and S., in the E. part of the state; alt. from 6,000 to 9,000 ft. It is chiefly composed of lava, with granite in the higher portions. (3.) Mountain range in E. of Jamaica, running from E. to W. and culminating at 7,423 ft. (4.) BLUE MTS., Pa. See KITTATINNY.

Blue Mountain Lake, a lake at the ft. of Blue Mt. (3,759 ft.), an Adirondack peak of Hamilton co., N. Y. The village is a summer resort. Pop. about 400.

Blue Nile. See NILE.

Blue Peter, a blue flag with white square in the centre, denoting the letter O in the international signal code; hoisted to show that a ship is about to put to sea. This practice is followed on the British navy, but a flag called the cornet is used on American men-of-war as a sailing signal.

Blue Pill, or *Pilula hydrargyri* contains free mercury in the proportion of one part in three with liquorice and confection of roses. It is a common purgative, acting probably by irritation of the intestinal mucous membrane, and resulting in peristalsis and a watery exudation. It hastens the evacuation of bile, but does not increase the amount secreted by the liver. Its action is commonly aided by the after-use of some saline draught.

Blue Ridge, a range of the Appalachian Mts., lying nearest to the Atlantic coast. It is highest in Virginia and North Carolina and is traced from the comparatively low headlands of West Point, N. Y., into Alabama. It should not be confused with the Kittatinny or Blue Mts. of Pennsylvania, which lie behind to the W. forming the other side of the Great Valley. The highest summits of the Appalachians occur in the Black Mt. group in North Carolina.

Blue Shark (*Carcharias glaucus*), a common shark, which sometimes reaches a length of 25 ft., though from 12 to 15 ft. is the usual size. Most abundant in tropical seas, its range extends northwards into the North Atlantic.

Bluestocking, a term applied contemptuously to a female pedant. It originated in connection with certain reunions held in London about 1780 by Johnson's friend, Mrs. Montagu, and other ladies. Hannah More addressed to them her poem of *Bas-Bleu, or Conversation* (2nd ed. 1787).

Bluethroat (*Cyanecula suecica*), a beautiful bird allied to the redstart, also called 'Swedish nightingale' and 'bluebreast;' which breeds in N. Europe, Siberia, Alaska, etc., winters in Abyssinia and India, and is seen in Europe in spring and fall.

Bluffton, city, Ind., co. seat of Wells co., 22 m. S. of Fort Wayne, on the Wabash R., and on the Cin., Bluffton and Chi., the Lake Erie and West. and the Toledo, St. Louis and West R. Rs. It has a foundry, machine shops, engine works, manufactures barrel-staves, etc., and is the shipping centre of an extensive trade in lumber and grain. Pop. (1910) 4,987.

Blum, HANS (1841), German jurist and historian, born at Leipzig. He was a member of the North German Parliament from 1867–70, and has written several works on jurisprudence and on the contemporary history of Germany, as *Auf dem Wege zur Deutschen Einheit* (2 vols. 1893), *Das Deutsche Reich zur Zeit Bismarcks* (1893), *Fürst Bismarck und seine Zeit* (6 vols. 1894–5), *Persönliche Erinnerungen an den Fürsten Bismarck* (2nd ed. 1900).

Blum, ROBERT (1807–48), German politician, born at Cologne. He helped to found (1840) at Leipzig the *Schiller Society,* and (1847) a publishing house from which he issued his *Staatslexikon.* Democratic leader in the revolution of 1848, he represented Leipzig in the Frankfort Parliament. Sent by the Left with a congratulatory address to the insurgents of Vienna, he led them at the barricades, but was taken prisoner and shot (Nov. 9) for having assumed arms against the imperial troops. The news excited the liveliest indignation throughout Germany, where $30,000 was raised for his widow and children. See his *Life,* by H. Blum (1878).

Blum, ROBERT FREDERICK (1857–1903), American painter, was born in Cincinnati, O., received a public school education, and was apprenticed to a lithographer at the age of sixteen. Subsequently he abandoned this work to study drawing and painting, and studied for a time at the Pennsylvania Academy of Fine Arts at Philadelphia. In 1879 he went to New York, where he received the helpful encouragement of Alexander W. Drake, the art editor. He made yearly trips abroad, and was elected a full member of the

National Academy of Design in 1892. His mural decorations of Mendelssohn Hall, New York, were his principal achievement in decorative work. In 1890–3 Mr. Blum visited Japan for the purpose of making his illustrations of Sir Edwin Arnold's *Japonica*.

Blumenbach, Johann Friedrich (1752–1840), German naturalist, born at Gotha. Appointed (1778) professor at Göttingen, he lectured there for nearly sixty years on natural history, anatomy, and medicine. In 1785, before Cuvier, he discerned that the true basis of zoological study is comparative anatomy, a science which he elaborated in *Handbuch d. vergleichenden Anatomie u. Physiologie* (1804; new ed. 1824). Devoting himself particularly to the history of man, he advocated the unity of the race, and made a collection of human skulls, supplying data for his *Collectio Craniorum Diversarum Gentium* (1790–1828). Original observations are also embodied in his *Ueber den Bildungstrieb* (1781), *Institutiones Physiologicæ* (1787; new ed. 1821), and other publications.

Blumenthal, Jacques, musical composer, was born at Hamburg (1829) and educated in Vienna and Paris, but is now a naturalized British subject, having lived in England since 1848. He is best known as a song-writer, his *Message*, *Requital*, *My Queen*, etc., having had considerable popularity.

Blumenthal, Leonhard, Count von (1810–1900), Prussian general. Appointed on the general staff in 1848, he distinguished himself in Denmark in 1849; took part as chief of the staff in the campaign against Denmark (1863–4); served as chief of the staff to the Crown Prince of Prussia in the Austrian campaign of 1866; and in the war with France (1870–1) he again acted as chief of the staff to the Crown Prince Frederick, and took part in the surrender at Sedan and in the siege of Paris. Created a field-marshal by the Emperor Frederick in 1888. He was one of the ablest strategists in the German army.

Blumenthal, Oskar (1852), German dramatist, founder and manager of the Lessing Theatre (1888–97) in Berlin, and author of a number of light and popular comedies, such as *Der Probepfeil* (1882), *Die Grosse Glocke* (1887), *Im weissen Rössl* (1898). He has also written light satirical works, as *Allerhand Ungezogenheiten* (1874; 5th ed. 1877), *Gemischte Gesellschaft* (1877), and *Aus heiterm Himmel* (1882).

Blunderbuss, a short gun, unrifled, and with a large bore, widening towards the muzzle, firing many balls or slugs, which scatter when fired, and can do execution within a limited range without exact aim being taken. The blunderbuss has long been obsolete.

Blunt, James G. (1826–81), American soldier, born in Hancock co., Me. He practised medicine in Ohio; became a free-state leader in Kansas, whither he removed in 1856; and during the Civil War served in the Federal army, rising to the rank of major-general of volunteers (commissioned Nov., 1862), commanding the Department of Kansas (1862–3), and being conspicuous in the border warfare of Kansas and Missouri. He was mustered out of service in July, 1865.

Blunt, John Henry (1823–84), English writer of theological and ecclesiastical books. Taking orders in 1852, he was presented with the crown living of Beverstone, in Gloucestershire, in 1873. He published *Annotated Book of Common Prayer* (1866), *Hist. of the Reformation* (1868), *Dict. of Theology* (1870), *Dict. of Sects and Heresies* (1874), and *Cyclopædia of Religion* (1884).

Blunt, John James (1794–1855), professor of divinity in Cambridge from 1839, is best known by his *Sermons*, and by his apologetic works, reissued as *Undesigned Coincidences in the Writings both of the Old and the New Testament* (1847). His *Hist. of the Christian Church during the First Three Centuries* (1856), and his lectures *On the Right Use of the Early Fathers*, were published after his death.

Blunt, Wilfrid Scawen (1840), English poet, born at Petworth House, Sussex; served in the British diplomatic service from 1858 to 1870. Blunt upheld the cause of Arabi Pasha in Egypt in 1882, and in 1887–8 took part in the anti-coercion movement in Ireland, for which he suffered imprisonment. He is a poet of a high order, except when political questions are the subject. His works include *Love Sonnets of Proteus* (1880); *The Future of Islam* (1882); *The Wind and the Whirlwind* (1883); *Ideas about India* (1885); *In Vinculis* (1889); *A New Pilgrimage* (1889); *Esther* (1892); *Griselda* (1893); *Satan Absolved* (1899). A useful selection of his *Poems* was made by W. E. Henley and G. Wyndham in 1898.

Bluntschli, Johann Kaspar (1808–81), Swiss jurist, born at Zürich. Professor at Zürich (1833), he published (1838–9) *Staats- und Rechtsgeschichte der Stadt u. Landschaft Zürich*, the tenor of which conforms with the principles of the historic school. In 1848 he was called to a law chair at Munich. His *Allgemeines Staatsrecht* (1852; 5th ed. 1875–6), translated into English (1885; 2nd ed. 1892) and French (1877), established his authority as a jurist. From 1861 professor at Heidelberg, and at the front of liberal movements, he co-operated in the foundation of the German House of Representatives (1862), and induced (1865) the upper house to voluntarily submit to reform. No less zealous for religious freedom, he was one of the most active members of the German Protestant Union. Bluntschli wrote several other books on German and Swiss law, politics, and history (*e.g. Geschichte der Republik Zürich*, 1847–56). His *Selbstbiographie* (3 vols.) appeared in 1884. His library is now the property of Johns Hopkins University, Baltimore.

Blushing is a reflex dilatation of the blood-vessels of the face and neck, due to vasomotor paralysis through the cervical sympathetic nerve, acted upon by the higher cerebral nerve centres, their action being initiated by the emotions of shame, bashfulness, timidity, and the like. The process is not fully understood. See Darwin's *Expressions of Emotions in Man and Animals* (1872).

Boa, a genus of very large snakes, confined to tropical America, and without poison fangs. Their great size (10 to 11 ft.) and strength enable them to crush their prey to death by coiling the pliant body round the victim. The habit has long been rendered familiar by descriptions of the boa constrictor. The process of digestion is long and laborious, and is aided by a copious discharge of saliva. Together with the anacondas (*Eunectes*), the boas form the family Boidæ, closely allied to the pythons of the tropics of the Old World. The anaconda is an aquatic boa, said to reach 30 ft. in length.

Boabdil, more correctly Abu Abdallah, last Moorish king of Granada. Rebelling against his father (1481), and then warring against his uncle, he so reduced the strength of the Moors that he had to surrender Granada to Ferdinand of Aragon (1492). Crossing (1493) to Africa, he fell fighting in the service of the king of Fez.

Boadicea, queen of the Iceni in Britain, who inhabited Suffolk and Norfolk. The outrages of the Romans (60 A.D.)—two of her own daughters having been ravished—caused her to head an insurrection during the absence of Suetonius Paulinus, the Roman governor, in Anglesey. She succeeded so far as to capture the towns of Camulodunum (Colchester) and Londinium, killing 70,000 Romans and their allies. But Suetonius, on his return, defeated the Britons with great slaughter, and the queen put an end to her life (62 A.D.). This victory secured the Roman dominion in Britain. See Tennyson's *Boadicea*, and Cowper's ode with the same title.

Boanerges, a name given by Jesus, in Mark 3:17, to the disciples James and John, the sons of Zebedee, and interpreted by the sacred writer as 'sons of thunder;' hence sometimes applied to a man of strong and vehement character.

Boar, or WILD BOAR (*Sus scrofa*), a mammal still found in many parts of Europe, Asia Minor, India, and N. Africa. It is believed to be the original of the domestic pig, from which it differs in certain minor points. The body is covered with long, stiff bristles, beneath which there is a softer curling undercoat, which is uniform in tint in the adult, while the young are striped. In the swamps which it usually haunts the boar is prevented from sinking in the mire by the broad spreading feet; on dry land it uses only the two median toes in walking, the lateral ones being too short to reach the ground. As is indicated by the generalized character of the teeth, the boar is practically omnivorous, though it depends largely upon roots, bulbs, and tubers, which are dug up by the sensitive snout with the help of the tusks. In the male the canines or dog-teeth are greatly developed, and make the animal a dangerous adversary when at bay. Zoologically the boar is of great interest, as being one of the most generalized of living even-toed ungulates, and as retaining the marshy habitat of the ancestral ungulates. Its unspecialized nature is shown especially in the number (44) and structure of the teeth, in the number (4) of the complete toes and the structure of the limbs, and in the simple nature of the stomach (contrast sheep and cow). It is the object of India's foremost sport, 'pig-sticking,' *i.e.* the chase of boars on horseback, and spearing them as they run. See also PIG.

Boarding-House. A private house maintained for furnishing table-board, usually with lodging. The private character of the house is what distinguishes it from an inn or hotel. The boarding-house keeper is not, like the innkeeper, bound to receive any proper person who seeks accommodation, nor is he subject to the extraordinary common law liability of the innkeeper for the goods of his guest, but only for reasonable care On the other hand the boarding-house keeper has not, in the absence of statute, the right to detain the baggage of his guest to secure an unpaid board bill, though the statutes of some states give him a lien similar to the innkeeper's common law lien. See INNKEEPER; LIEN.

Boardman, GEORGE DANA (1828-1903), American clergyman, the son of a Baptist missionary, was born at Tavoy, Burma, and graduated (1852) at Brown University. He was installed pastor of a Baptist church in South Carolina, 1855, but resigned on account of a difference of views with his parishioners on the slavery question. Dr. Boardman was pastor of the First Baptist church of Philadelphia from 1864 to 1894, when he retired as pastor emeritus. He was active in movements for international arbitration, and lectured on this subject. Some of his books are *The Creative Work* (1878), *The Divine Man* (1889), and *The Problem of Jesus* (1891).

Board of Trade and Plantations. An English governmental board, established in 1696 to exercise general jurisdiction over colonial affairs, examine and pass on colonial laws, suggest legislation concerning the colonies, and have to do especially with their colonial affairs. Previously various temporary boards had discharged the same or very similar functions; for instance Charles II. established a 'Council of Trade' and a 'Council for Foreign Plantations' in 1660, and the two were combined in 1672 as the 'Council for Trade and Plantations,' which went out of existence in 1688. The importance of the Board greatly decreased after 1762, when a Secretaryship of State for the Colonies was established, and both the Board and the Secretaryship were abolished in 1782. The Board's full title was the 'Board of Commissioners for Trade and Plantations,' and its members were known as the 'Lords Commissioners for Trade and Plantations.'

Board of War, the name of two boards, or committees, appointed by the Continental Congress during the American Revolution to look after the raising and equipping of troops. The first, created on June 12, 1776, was known as the Board of War and Ordnance, and consisted of five members of Congress: John Adams (chairman), Roger Sherman, James Wilson, Edward Rutledge, and Benjamin Harrison, with Richard Peters as Secretary. On Oct. 17, 1777, a new board, known simply as the Board of War, was created, and the members of this board, first three and subsequently five in number, were not members of Congress. Gen. Horatio Gates became the chairman. The board was abolished in 1781.

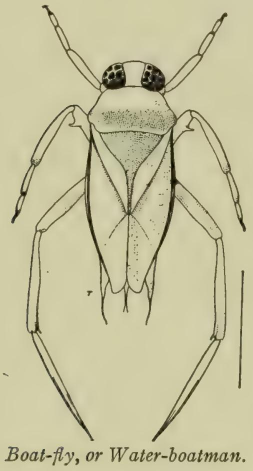
Boar-fish, a name applied to two distinct fish—(1) to an Australian food-fish (*Histiopterus recurvirostris*) belonging to the perch family, and (2) to the Mediterranean *Capros aper*, one of the horse-mackerels, which is caught for market.

Boas, FRANZ (1858), German-American anthropologist, was educated at German universities and, as early as 1883-4, made a voyage to the Arctic and explored Cumberland Sound, returning to New York city. Two years later he entered upon a study of the Indians of British Columbia for the British Association, and subsequently for the N. Y. Museum of Natural History. In 1898 he was appointed professor of anthropology at Columbia University, and in 1901 curator of the department of anthropology at the American Museum of Natural History, and he was also made philologist in the Smithsonian Institution. Author of *Baffin Land* (1885) and a number of works on the customs and languages of the N. A. Indians and Eskimos.

Boat, a term now indiscriminately used for sea and river vessels of all kinds, but more properly applied to a vessel that can be hauled up on or launched from a beach. It may be propelled by oars, sails, steam, or other motive power. From the earliest ages men have used buoyant contrivances to float them across streams and lakes. The primitive log or number of logs lashed together to form a raft, or bundles of brushwood or reeds used for the same purpose, early developed into the parent of modern boats, the dug-out, which has been found in association with Stone Age remains and in Swiss lake dwellings. Bark canoes and wickerwork frames covered with skins, such as the coracle of the ancient Britons, are a further development. The catamaran clearly exhibits its connection with the raft, so modified as to afford less resistance to the water. Modern boats are of many kinds, according to the purpose for which they are intended and the character of the waters on which they are to sail. They are usually classed for racing purposes as open, half-decked, and decked boats. The canoe, punt, skiff, gondola, dingy, and outrigger are used on smooth water for pleasure and racing. The boats used by watermen vary greatly, according to the locality. Whale-boats are sharp at both ends, and may be steered with an oar or ordinary rudder. Life-boats (see LIFE-SAVING APPARATUS) are provided with air chambers, which render them self-righting or self-bailing, or both combined. The following boats are used in the U. S. navy for rowing and sailing: barge, cutter, whale-boat, gig, and dingy. Steam launches and cutters are also employed. Every sea-going ship is by law required to carry a specified number of boats, according to the tonnage. Sea-going ships carrying passengers must carry life-boats, and have sufficient boat accommodation for all the passengers carried.

Boatbill (*Cancroma cochlearia*), a S. American night-heron, remarkable for its broad head ending in the peculiar flattened and keeled bill to which it owes its name. The birds occur especially in the woods bordering the rivers of Brazil, and feed upon worms and other aquatic organisms. See HERON.

Boat-fly, or WATER-BOATMAN (*Notonecta*), a carnivorous bug living entirely in the water. It is peculiar in that it always swims back downwards, and is exceedingly common in ponds, where it may be seen rising to the surface to breathe.



Boat-fly, or Water-boatman.

Boat Race. See ROWING.

Boatswain, a warrant-officer in the U. S. navy. The term is derived from 'boat's swain,' or husband. According to Sir Harris Nicolas's account of the 'buscarles,' every ship was anciently in charge of a 'batsuen,' who commanded her crew in action, and acted at all times as master pilot or steersman. The office of boatswain, although long in use, in the British Navy received recognition for the first time when the navy was increased in the 16th century. When the U. S. navy was formed, the practice of the British navy was in this, as in most other respects, followed quite closely. A boatswain has charge, under the supervision of the executive officer, of the rigging, anchors, cables, boats, and other equipment. Assisted by his mates, he summons the crew at all general drills and evolutions and acts as assistant to the executive officer in carrying on the work of the ship. For the purpose of attracting attention as a preliminary to passing orders he sounds his 'call' on his 'pipe' or whistle, and this, both for him and for his mates, is a sort of badge of office. When a boatswain has served 6 years in that grade he is advanced to the grade of chief boatswain and commissioned with the rank of ensign. Vacancies in the grade of boatswain are filled by the appointment of competent petty officers. The pay of a boatswain when at sea is $1,200 per annum with an increase of $200 for each period of three years service until the maximum of $1,800 is reached. Chief boatswains receive the same pay as ensigns. There are at present 66 chief boatswains and 81 boatswains.

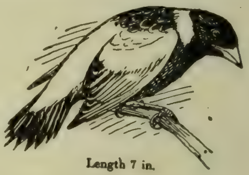
Bobadilla, FRANCISCO DE (?–1502), Spanish magistrate in Hispaniola, or Santo Domingo, a knight commander of the Order of Calatrava. In 1500 he was sent to Hispaniola, with plenary powers in civil and criminal matters, by Ferdinand and Isabella, to investigate the numerous charges which had been brought against Columbus, and to take such action as might seem necessary. He appears to have been unscrupulous and overbearing, and on reaching the island seized the public and private papers and certain property of Columbus, put Columbus in irons and grossly maltreated him, and soon sent him, still manacled, to Spain. After a short period of mismanagement, Bobadilla was superseded (1502) by Nicholas de Ovando, and lost his life at sea (probably in July, 1502), while being sent back to Spain.

Bobbins, wooden rollers with axial perforation by which to place them on a spindle, and flanged at each end. It is on bobbins that yarn is wound. In throstle-spinning the bobbins receive the threads of wool, cotton, etc., from the drawing rollers. The largest bobbins are used for the slubbing frames, where, from the lap shape in which it comes from the carder, the cotton passes into a loose strand. The most familiar form of bobbin is the pirn or spool of sewing-thread. Metal bobbins are used for lace-making. Paper tubes are now largely taking the place of bobbins.

Bobbio, tn. and epis. see, prov. Pavia, Italy, on the Trebbia, 26 m. S.W. of Piacenza. Near it, in 612, St. Columbanus founded an abbey, which possessed a famous collection of historical MSS., now for the most part in the Vatican. There is an old cathedral. Pop. (1901) 4,876.

Bobcat. The name of the smaller and more southerly species or varieties of the North American lynx (q.v.), distinguishing them from the larger northern 'Canada lynx.' It refers to the brevity of the tail, and is coming into general use in scientific as well as popular books.

Bobolink, or RICE-BUNTING (*Dolichonyx oryzivorus*), a N. American bird, famous for its song, powers of flight, and especially for the flavor of its flesh. It is related both to the buntings and to the family leteridæ. The male in summer (breeding plumage) has a gay dress of black and white with yellow markings, while the female and young are in conspicuous yellowish brown. Bobolinks breed in the Northeastern states, nesting in the grass or among grain; and at this season the males fly about the fields uttering a gay, rollicking song, while tumbling and fluttering in the air. In the early autumn they moult, and the succeeding (winter) plumage of both sexes is plain brown. They migrate southward in flocks, crowd into the marshy districts of the coast of the middle states, and are shot for market in great numbers as 'reed-birds,'—a delicacy of the season. The survivors move on to the rice plantations of the Gulf states, or farther, and in the late winter greatly damage the rice-crops. They are known there as 'rice-birds,' and are slaughtered mercilessly as a nuisance. The result is their growing scarcity in the North and elsewhere.



Bobolink.

Bobrinets, tn. of Kherson gov., 120 m. N. of Kherson city, on the Bobrinets, affluent of the Bûg. Tobacco manufacture. Pop. (1897) 14,352.

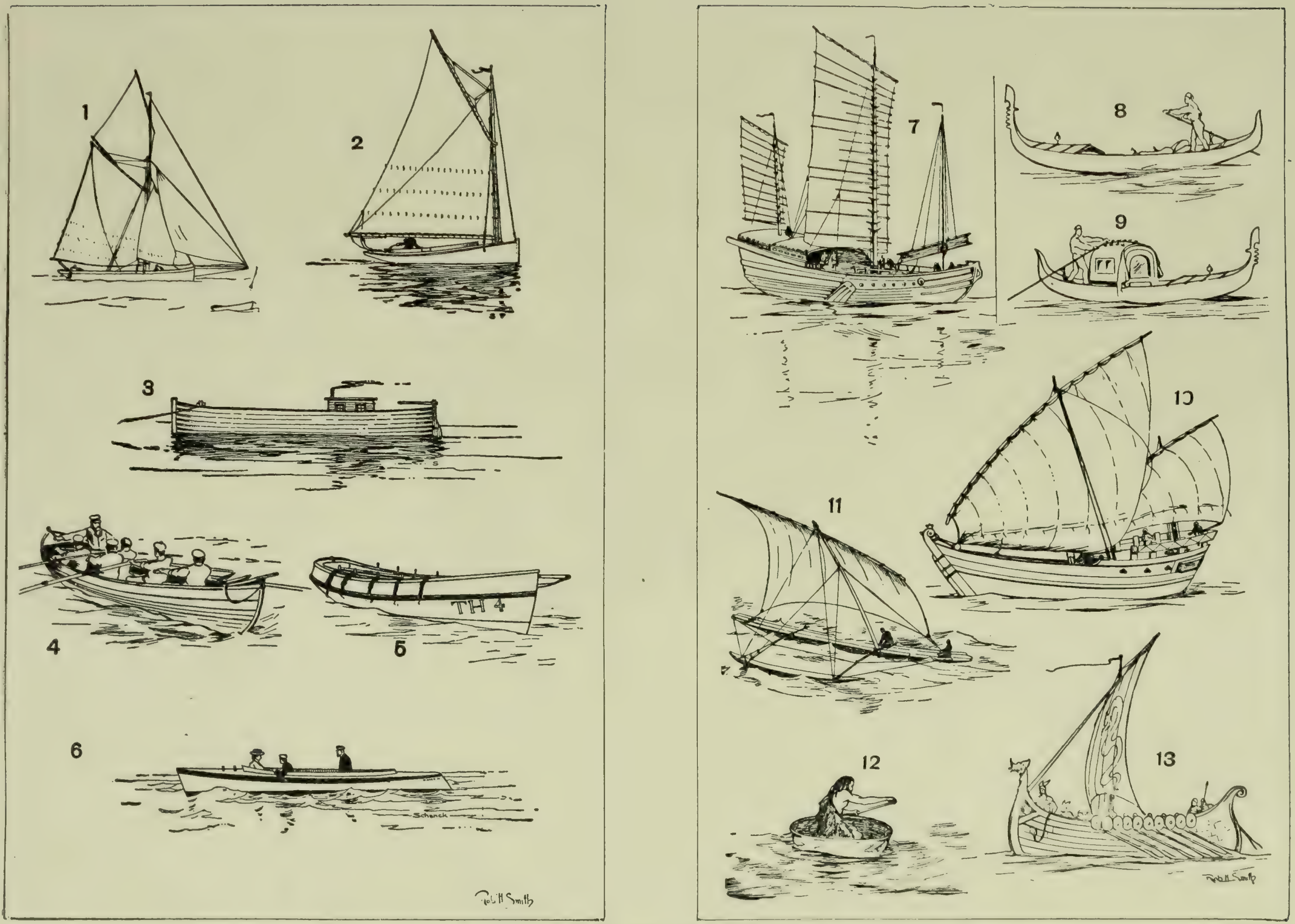
Bobruisk, tn., Minsk gov., cap. of a dist., with strong fortress (besieged by the French in 1812), on Berezina, 103 m. by rail S.E. of Minsk. Pop. (1897) 35,177.

Bobwhite. A sportsman's name, taken from its cry, of the quail or partridge (*Colinus Virginianus*) of the Eastern U. S.

Bocas del Toro, seapt., Panama, on island of same name, at entrance to Bay of Chiriqui. Pop. 5,300.

Boca del Drago, TIGRE, TORO. See CHIRIQUI.

Bocaue, pueb., Bulacán prov., Luzon, P. I., 15 m. N.W. of Manila, on one of the mouths of the



TYPES OF BOATS BELONGING TO VARIOUS TIMES AND PLACES.

1. Cutter. **2. Catboat.** 3. Canal boat. 4. Whale boat. 5. East coast coble (British). **6. Motor boat.** 7. Chinese junk. **8. 9. Venetian gondolas.** **10. Slave dhow.** 11. Malay proa 12. Coracle. 13. Viking boat.

Grande de Pampanga and on the Manila and Dagupan R. R. It has a city hall, 2,000 stone and many other well-built houses. It has an important trade on the river and with Manila. Pop. (1903) 8,438.

Boccaccio, GIOVANNI (1313–75), great Italian writer and humanist, was born at Paris, the natural son of a Florentine merchant. In 1334 (or 1338) he fell in love with Maria d'Aquino, a natural daughter of King Robert of Naples This passion directly or indirectly inspired the poet to the composition of a number of works—the *Rime*, *Filocolo*, *Filostrato*, *Teseide*, *Amorosa Visione*, and *Fiammetta*. In 1340 he was recalled to Florence by his father. From 1345 to 1347 he dwelt in the Romagna, till, in 1349, his father's death compelled him again to return to Florence. In 1350 he entertained as his guest Petrarch, with whom he formed a close friendship. In 1359 Petrarch endeavored to work on Boccaccio's religious feelings, and three years later a priest, Gioacchino Ciani, effected a complete change in his moral views and conduct. In 1363 he withdrew to Certaldo (near Florence), where he passed the remainder of his life, except for embassies to Avignon(1365)and to Rome (1367), a visit to Petrarch (1368), and the Dante lectures which he delivered at Florence in 1373 and 1374.

The list of his works in verse is headed by the *Rime*, mostly composed between 1334 and 1348 (a good ed. by Baldelli, Leghorn, 1802). The *Amorosa Visione* (*c.* 1342; 1st ed. Milan, 1521) is outwardly, in metre and framework, imitated from the *Commedia*. In *Filostrato* (*c.* 1338; 1st ed. Venice, 1480), in the *Teseide* (*c.* 1341; 1st ed. Ferrara, 1475), and in the *Ninfale Fiesolano* (date uncertain; 1st ed. Venice, 1477; a good reprint in Torraca's *Poemetti Mitologici dei Sec.* xiv., xv., xvi., Leghorn, 1888), Boccaccio employed, for the first time in narrative poetry, the octave stanza, which was afterward so prominent in Italian literature.

The series of prose works opens with the prolix *Filocolo* (1338–40; 1st ed. Florence, 1472; Eng. trans. by H. G., London, 1567). This was succeeded by the *Ameto* (1341–2; 1st ed. Rome, 1478); *Fiammetta* (before 1343; 1st ed. Padua, 1472), the heroine of which stands for Maria d'Aquino, and the hero, Pamfilo, for Boccaccio himself; the *Corbaccio*, or *Laberinto d'Amore* (1354; 1st ed. Florence, 1487); and the *Vita di Dante* (*c.* 1364; best ed. that of Macrì-Leone, Florence, 1888; Eng. versions by Wicksteed, Hull, 1888, and Carpenter, New York, 1900; the former is restricted to the purely biographical sections), a sequel to which was his *Commento sopra la Commedia* (1373–5; ed. by Ciccarelli, Naples, 1723; better by Milanesi, Florence, 1863). The best collective edition of the minor works is still Moutier's *Opere Volgari di G. B. Corrette su i Testi a Penna* (Florence, 1827–34, vols. v.–xvii.).

The *Decamerone*, the book on which rests Boccaccio's chief claim to immortality, was composed for the most part between the years 1348 and 1353. The framework of the tales describes how, while the plague is raging at Florence in 1348, seven maidens and three youths of noble birth repair to a villa near the city, and, to while away the time, tell each a tale on ten successive days, making one hundred stories in all. The tales go back to the most various sources—Eastern, classical and French stories, contemporary events, anecdotes, and scandals. (See Landau, *Die Quellen des Dekameron*, 2nd ed. Stuttgart, 1884.) Though the majority of the themes are undoubtedly immoral, Boccaccio's treatment is never obscene. His tales mark an enormous improvement on those that had gone before. The novel becomes in his hands a vehicle for dramatic development and psychological analysis; and many are the great writers who have borrowed from him—Chaucer, Shakespeare, Dryden, Lope de Vega, Molière, La Fontaine, Musset, Hans Sachs, and Lessing, to name but a few. The first edition is that of Venice (1470), and specially important among the early ones is that of Giunti (Florence, 1573). Good modern editions are those of P. Dal Rio (Florence, 1841–4) and P. Fanfani (*ib.* 1857). Hitherto the MS. Mannetti (1384) of the Laurenziana (diplomatic reprint, Lucca, 1761) was considered the best; now the claims of the Berlin Hamilton MS. are being advanced. (See the treatise by Tobler, 1887, and by Hecker, 1892.) English versions: Anonymous, 1620 (vol. i. only); anonymous, 1702; Dryden's *Fables* (a smal, selection in verse), 1713; Balguyl 1741; Dubois, 1804; Kelly, 1855; Wright, 1874; Payne, 1886; unexpurgated trans. (1874).

Boccaccio.

His Latin works consist of:—(*a*) *De Genealogiis Deorum Gentilium* (1350–60; 1st ed. Venice, 1472; Ital. trans. Venice, 1547). (*b*) *De Claris Mulieribus* (1352–62; 1st ed. Ulm, 1473; by Albanzani, 3rd ed. Bologna, 1875). (*c*) *De Casibus Virorum* (*c.* 1363; Italian version, Venice, 1545; English paraphrase by Lydgate, *Falls of Princes*, 1st ed. 1494). (*d*) *De Montibus, Silvis, Fontibus, Lacubus, Fluminibus, Stagnis et Paludibus, et de Nominibus Maris* (1st ed. Venice, 1472; Italian version, Venice, 1520). The few Latin letters are distinguished in neither form nor matter (edited, together with some Italian ones, by Corrazzini, Florence, 1877). More interesting, as throwing light on contemporary events, are the eclogues of the *Bucolicon* (Florence, 1504).

For a full account of all the editions, see *Serie delle Edizioni delle Opere di G. B.* (Bologna, 1875). Biographers, Manni (1742) and Baldelli (1806). Landau (Stuttgart, 1877; Italian version by Traversi. much enlarged, Naples, 1881) and Veselovsky (St. Petersburg, 1893–4) deserve careful study. See, too, J. A. Symonds, *Boccaccio as Man and Author* (London, 1895); and W. P. Ker, *Boccaccio* (Oxford, 1900).

Boccage, MARIE ANNE FIQUET DU (1710–1802), French poet, born at Rouen. Emulating Milton, she wrote *Paradis Terrestre* (1748); the poem *Columbiade* (1756), which brought her into notice; and *Letters concerning England* (1770). She was highly praised by Voltaire.

Boccalini, TRAJANO (1556–1613), Italian satirist, born at Loreto; became governor of several cities under the papal see (1608–11). In 1612–13 appeared his *Ragguagli di Parnaso*, a work full of brilliant satire against contemporary politics and literature. An unfinished sequel, *La Pietra del Paragone Politico*, was completed by Girolamo Briani (1615). An English version of these works, *Advertisements from Parnassus, together with the Politick Touchstone*, by Henry, Earl of Monmouth (London, 1656), reached the 3rd edition in 1674. Boccalini's *Commentarii sopra Cornelio Tacito* (Geneva, 1669) is couched in the same vein as the *Ragguagli*. See G. Mestica, *T. B. e la Letteratura Critica e Politica del Seicento* (Florence, 1878); G. Silingardi, *La Vita, i Tempi e le Opere di T. B.* (Modena, 1883).

Bocca Tigris, or BOGUE FORTS, at mouth of Canton R., China; taken by British in 1841, and again in 1856.

Boccherini, LUIGI (1743–1805), Italian musical composer and 'cellist, born at Lucca; studied at Rome, and spent the greater part of his life (from 1768) at Madrid as court composer. His instrumental works—mostly quintets, quartets, and trios—number 366; but of these 74 are unpublished. Of his vocal works, only the *Stabat Mater* is published. His best works are still much appreciated for their originality, dignity of style, and melodiousness. See *Life*, in German, by Schletterer.

Bocchus, king of Mauritania in Africa, father-in-law of Jugurtha, with whom he fought for a time against the Romans, but, changing sides, betrayed him to Sulla in 106 B.C. See Mommsen's *Hist. of Rome*.

Bochart, SAMUEL (1599–1667), born at Rouen. As pastor in Caen, he publicly defended (1629) Protestantism in a public discussion with Véron, a Jesuit. His immense learning was exhibited in his *Geographia Sacra* (1646; later editions in 1651, 1674, 1681), on early Scripture history. After a brief visit (1662) to Stockholm, he published (1663) his greatest work, *Hierozoicon* (1675, 1793–6), mainly on the natural history of Scripture, but also on fabulous animals in other literatures. See Haag's *La France Protestante*, vol. ii. (1846–59); *History of Rationalism*, by Hurst (9th ed. 1882); and *German Rationalism* (trans. 1865), by Hagenbach.

Bochold, vil., prov. Rhineland, dist. Düsseldorf, Prussia, 3 m. N.W. of Essen. Pop. (1900) 21,278.

Bocholt, tn., prov. Westphalia, dist. Münster, Prussia, 13 m. by rail N. of Wesel, with cotton industries. Pop. (1900) 21,278.

Bochum, tn., prov. Westphalia, Prussia, 10 m. E.N.E. of Essen by rail; one of the chief centres of the Westphalian iron, steel, and coal industries, with coal mines, tin-smelting, brickworks, etc. Pop. (1900) 65,551.

Böcking, EDUARD (1802–70), German lawyer, born at Trarbach, on the Mosel; in 1835 became professor of jurisprudence as Bonn. He published valuable editions of classic works of law, as *Notitia Dignitatum* (5 volt. 1839–50); *Institutionen, or Pandekten des Römischen Privatrechts* (2 vols., 2nd ed., 1853 and 1855). He also edited the complete works of Ulrich von Hutten (5 vols. 1859–62).

Böcklin, ARNOLD (1827–1901), Swiss painter, a native of Basel. After studying (1845–50) in Düsseldorf, Antwerp, Brussels, and Paris, he settled in Rome, but in 1856 moved to Munich. Here he found a much-needed patron in Baron von Schack. Then he acted as art teacher at Weimar (1860–63), painted in Basel (1866–71), in Munich again (1871–4), and lived at Florence (1874–85), Zürich (1885–92) and Fiesole (1892–1901). One of the most notable painters of modern Teutonic art, he makes the figures and the backgrounds of the old (classic) myths live again before our eyes. He has besides a decided leaning to the weird and the grotesque. Among his more remarkable works are *Pan amongst the Reeds*, *Pirates Plundering a Castle*, *Island of the Dead* (1883), *Panic Terror*, *The Sport of the Waves*, *The Stillness of the Sea*, *Tritons and Nereids*, *The Island of the Blessed*, *Battle of the Centaurs*, *Petrarch*, and *The Plague* (these three at Basel), and *Sea Surges* and *A Recluse Playing the Violin* (at Berlin). See *Life* by Schmid in the portfolio of Böcklin's works (4 vols. 1892–1901); also monographs, in German, by Meissner (1898), Schick (1902), Mendelssohn (1901), and Floerke (1902).

Bocland ('book-land'), an Anglo-Saxon tenure (called also CHARTER-LAND, or 'deed-land') conveyed by *boc* (written 'charter') to a private owner, and held by a short and simple deed under certain rents and free services. From the bocland tenure are derived most of the freeholds holden of particular manors, and owing them suit and service. See MANOR; TENURE.

Bocskay, STEPHEN (1556–1606), prince of Transylvania from 1604 to 1606. In 1604 the brutal conduct of Basta in Transylvania, and the attempts of Rudolf II. of Austria to destroy religious liberty in Hungary, led to an insurrection in Transylvania and in Hungary, the leader of which was Bocskay, who was proclaimed prince of Transylvania.

Bode, JOHANN ELERT (1747–1826), German astronomer, born at Hamburg. Director of the observatory in Berlin (1772–1825), he founded the *Astronomische Jahrbucher* (1776). His *Uranographia* (1801; new ed. 1819) comprises some 12,000 stars more than the earlier maps. His *Représentation des Astres* (1782), in 34 sheets, contains all the stars above the horizon, visible to the naked eye from Berlin, as also the most important telescopic stars. An empirical formula denoting the relative distances of the planets is called 'Bode's Law.' Place a row of fours under the names of the planets ranged in a line according to their distances. Then under this row 0, 3, 6, 12, and so on. Add the two columns: the result shows the relative distances of the planets. The real relative distances, the earth's distance being reckoned as 10, are:—

3.9 7.2 10 15 27.5
52 95 192 300

Bode also wrote *Anleitung zur Kenntniss des gestirnten Himmels* (1768; 11th ed. 1858) and other books.

Bodensee. See CONSTANCE, L.

Bodenstedt, FRIEDRICH MARTIN VON (1819–92), German poet and dramatist; taught in Russia (1841–7), and became (1854) professor of Slavonic languages and (1858) of Old English literature at Munich. From 1867–73 he was connected with the famous Court Theatre at Meiningen, and from 1879–82 he was in the U. S., where he lectured, publishing a description of his travels in 1882 under the title 'From the Atlantic to the Pacific Ocean.' He was a prolific original writer and translator. With Paul Heyse, Wilbrandt, Herwegh, Gildemeister, and others, he issued a German translation of Shakespeare's plays (9 vols. 1866–72) and sonnets (1862), and wrote useful books on Shakespeare's contemporaries (1862), female characters (1875), and so forth. He also wrote on Russian subjects; published original plays, such as *Kaiser Paul* (1876); various volumes of verse, including *Epische Dichtungen* (1863), and tales. See his *Ausgewählte Dichtungen* (1864) and *Gesammelte Schriften* (12 vols. 1865–69). From a certain easy philosophy, exemplified in his most celebrated poetic work, *Lieder des Mirza Schaffy* (1851; 145th ed. 1893; Eng. trans. 1880), Bordenstedt has been called *Der Horaz der deutschen Bourgeoisie*. The man and his works are best seen in his egoistic *Erinnerungen aus meinem Leben* (1892), and in an interesting series of letters edited by G. Schenck (1893).

Bodin, JEAN (1530–96), French political philosopher; born in Angers, and studied at Toulouse. In 1561 he went to Paris as an advocate, and in 1566 he published a treatise on the method of studying history, which evoked the wrath of the great jurist Cujas. In spite of his Protestantism Bodin began to rise in the official world. Though he had opposed Charles IX., and narrowly escaped the massacre of St. Bartholomew (1572), he was made king's advocate at Laon. In 1580 he published his treatise on political philosophy, *La République*

(Latin trans. 1586; English, 1606), in which he builds upon the family as the basis of settled government, the supreme embodiment of which is the sovereign. The Catholic League, however, became so strong that in 1589 Bodin felt compelled to join its ranks. By this time he was *procureur général*, and a marked man. In 1593, after the victories of Henry IV., Bodin once more ventured to break openly with the League. His *Heptaplomères* (first published in 1857) is a plea for religious toleration; though in his chief work, and in *Démonomanie* (1580), he shows himself a believer in the superstitions of his age. See Boudrillart's *Bodin et son Temps* (1853), and Sir F. Pollock's *Science of Politics* (new ed. 1902).

Bodleian Library, Oxford, named after Sir Thomas Bodley, who, after the complete destruction (before 1556) of the university library of Oxford, dating from 1409, restored it (1598) by a gift of books collected by himself at a cost of £10,000. The library was opened (1603) with upwards of 2,000 vols. Later contributors include the Earl of Pembroke, with 250 vols. of Greek MSS.; Kenelm Digby, 238 MSS.; Archbishop Laud, 1,300 MSS. in more than twenty languages; and Robert Burton. Of John Selden's library the Bodleian received over 8,000 vols. General Fairfax enriched it with many MSS., including Dodsworth's 160 vols. in English history. Bishop Rawlinson's bequest (1755) included some 1,900 printed books and over 4,800 MSS. Nineteenth century donations comprise Richard Gough's collection (1809), numbering 3,700 vols. on Saxon and Northern literature; Edward Malone's collection of English drama and early poetry; Francis Douce's collection (1834); and Robert Mason's bequest (1841) of £36,000, the interest to be expended on books. The library now has nearly half a million volumes. It is entitled to a copy of every book printed in the United Kingdom. The first catalogue of its printed books was published in 1605, by its first librarian; the last in 1843, in 3 vols., by its eleventh librarian.

Bodley, Sir Thomas (1545–1613), English diplomatist and scholar. In 1585 he began his diplomatic career with a mission to Denmark. In 1589 he became the queen's representative in the United Provinces, where he acted as a member of the council of state until 1596. The rest of his life was devoted to the foundation and development of the Bodleian Library at Oxford. See his own autobiographical *Reliquiæ Bodleianæ* (1703); Wood's *Athenæ Oxon* (1813–20); Macray's *Annals of the Bodleian Library* (1868).

Bodmer, Johann Jakob (1698–1783), one of the chief pioneers in the regeneration of German literature in the 18th century; was a native of Zürich, where (1725–75) he was professor of Swiss history. With Breitinger and others he founded a weekly critical periodical (1721–3), *Die Diskurse der Maler*, the object of which was to emancipate literature from the trammels of pedantic rule. The new 'Swiss' school won its way slowly, until its principles were adopted by Lessing and others. Bodmer also drew attention to the old German epics, particularly the *Nibelungenlied*, of which he edited part in 1757. He greatly admired Milton, and translated the *Paradise Lost* into German. For Life and bibliography, see J. Baechtold's *Geschichte der Deutschen Literatur in der Schweiz* (1887–92).

Bodoni, Giambattista (1740–1813), Italian printer. During his early manhood he worked (from 1758) in the printing-house of the Propaganda in Rome, and afterward (1768) became superintendent of the Duke of Parma's press. In 1788 he published *Manuale Tipografico*, a collection fo 178 different types, increased in the 2nd ed. (1818) to 250. Between 1791 and 1813 he issued many beautiful editions of the classics, notably a *Homer* in 1808; but they are more distinguished for typographic beauty than for accuracy.

Body of Liberties, a well-known code of laws and 'bill of rights,' drafted by Rev. Nathaniel Ward, and adopted in Dec., 1641, by the General Court of the colony of Mass.; much of it was subsequently embodied in the formal laws of the colony, and it was thus the foundation of the Mass. legal code. It was, for the time, an enlightened code in many respects, establishing equal justice for all and security of person and property under the law. The text of the Body of Liberties may be found in MacDonald's *Select Charters and Other Documents illustrative of American History*, 1606–1775 (1899).

Body's Island, long sandy island off coast of N. Carolina. A lighthouse, having a fixed white light of the first order at a height of 156 ft. above mean high water, stands 2 m. from its S. extremity.

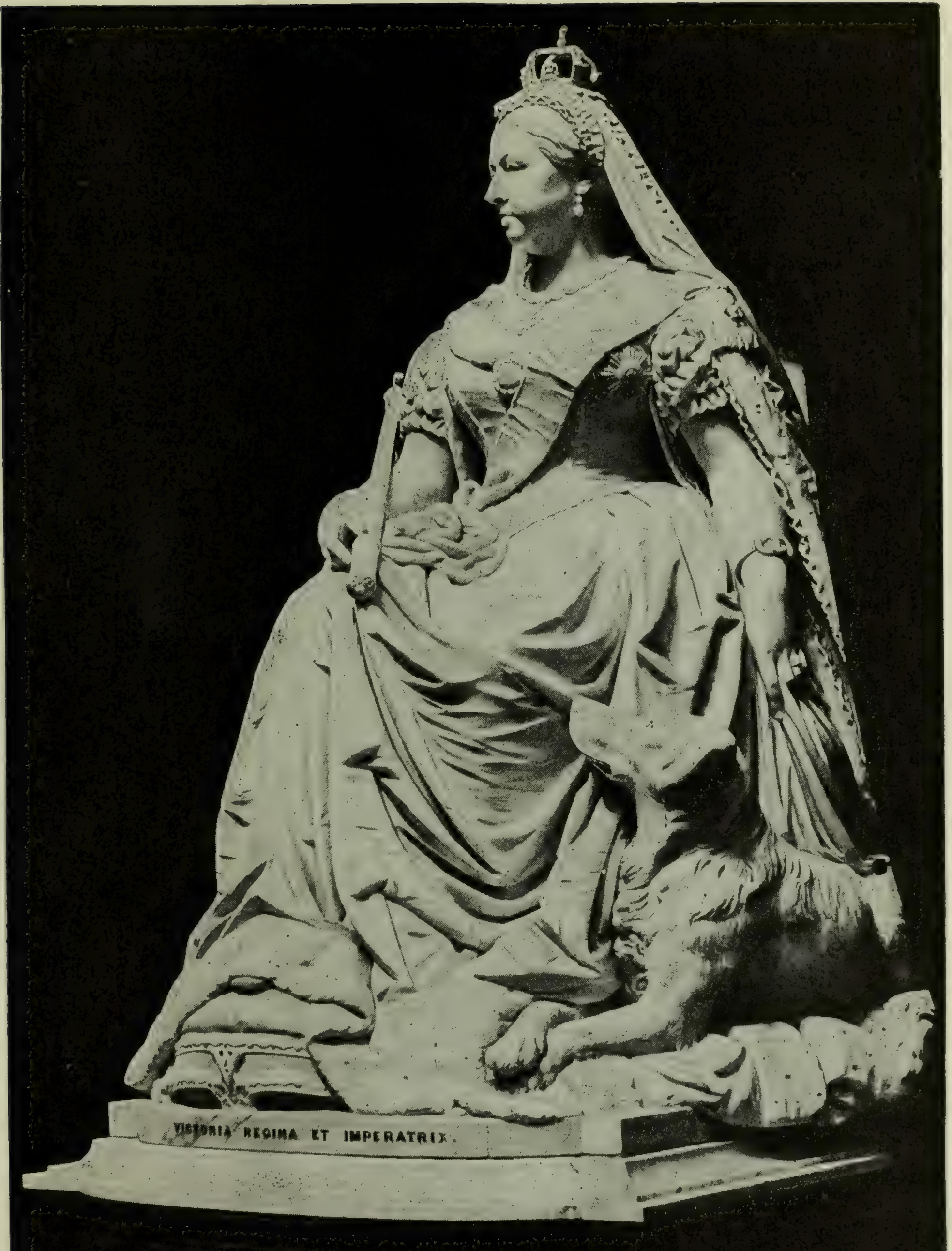
Body-Snatching. The criminal offence of taking and carrying away a dead human body without authority from those having the legal custody thereof. The law vests in the family or next of kin, or, in some instances, in the county or state authorities, the right to direct the burial, cremation, or other disposition of the body of a dead person. The taking of such a body by any one else and without an order of the courts, either before or after burial, whether for purposes of dissection or otherwise, is a misdemeanor, punishable by fine or imprisonment.

Boece, or Boethius, Hector (*c.* 1465–1536), Scottish historian, was probably the son of Alexander Boyis, a burgess of Dundee. He studied in Paris, became a professor in the college of Montaigu in 1492, and made the acquaintance of Erasmus. He returned to Scotland about 1498, and became principal in 1505 of the University of Aberdeen. In 1522 he published the *Lives* of the bishops of Mortlach and Aberdeen (new ed. Bannatyne Club, 1875), at the press of Jodocus Badius in Paris; and in 1527 the *Historia Gentis Scotorum*, his most famous work, which was translated (1533) into Scottish prose at the request of James V., and into English for Holinshed's *Chronicles* in 1577.

Boeckh, Philipp August (1785–1867), classical philologist, born at Karlsruhe. Having since 1803 studied under Wolf, he became professor of philology in 1807 in Heidelberg, and in 1811 in Berlin, where he acted also from 1812 as director of the philological, and from 1820 of the pedagogical, seminary. His *Public Economy of Athens* (1817; enlarged 1840), of which there is an excellent translation by A. Lamb (1857), presents a complete and minute picture of classic Athens from every point of view. His edition of Pindar (1811–21) establishes the present basis of metre. His great work, *Corpus Inscriptionum Græcarum*, was continued by Franz, Curtius, Kirchhoff, and Röhl (1828–77). His minor writings appeared in 7 vols. (1858–74).

Boehler, Peter (1712–75), Moravian bishop, was born in Frankfort-on-the-Main, Germany, graduated at Jena, and in 1737 was ordained a Moravian minister by the founder of the brotherhood. He was sent as a missionary to the negro population of Carolina and Georgia, 1737, and, meeting with the Wesleys in England on his way, is recorded as having been the instrument for converting John Wesley. Boehler's mission in the South was broken up by the mas with Spain in 1740, and he removed to Pennsylvania and there established the Moravian settlement at Bethlehem. He visited Europe in 1741 and 1745, and in 1748 was made bishop of England, Ireland, Wales and America. He resided in Germany after 1764, having been made one of the directors of his order. See Lockwood's *Life* (1868).

Boehm, Sir Joseph Edgar (1834–90), British sculptor, born

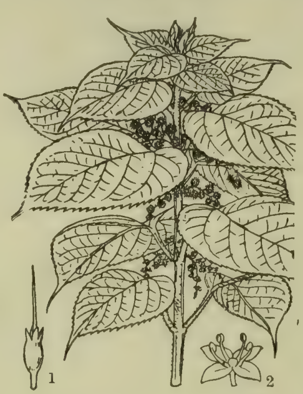


SIR JOSEPH EDGAR BOEHM'S STATUE OF QUEEN VICTORIA IN WINDSOR CASTLE.

in Vienna, and studied in Italy, France, and in England, where he settled in 1862, and was elected A.R.A. (1878) and R.A. (1882). His chief works are: Statue of Queen Victoria (1869) in Windsor Castle, of Carlyle at Chelsea, and of Wellington at Hyde Park Corner; the Duke of Kent Monument in St. George's Chapel, and the Stanley Sarcophagus in Westminster Abbey. Boehm was appointed sculptor-in-ordinary to Queen Victoria (1881), and created baronet (1889).

Boehme, or BOEHM (called also in England BEHMEN), JAKOB (1575–1624), German philosopher and mystic, was born at Altseidenberg, near the town of Görlitz. As a boy he conceived a profound mystic sense of God in nature, which seemed an intimate revelation; and this emotional temperament grew into a consuming passion for truth. Boehme's books were limited to the Bible, in which he was deeply versed, and to a few theosophical and alchemistic writings, such as those of Paracelsus; and the task before his illiterate genius was to shadow forth, in those obscure symbols, natural images, and poetic suggestions which were his only instruments, philosophical conceptions which were new to his age, and which later were not easily expressed by Hegel. For Boehme, God is the One from whom all creation proceeds by His self-differentiation into a negation of Himself. Spirit cannot be, except it distinguishes that which is not itself from itself; and this inner difference, beginning in God, and reproducing itself in all consciousness, is the principle by which the whole world is evolved. This negation of self, by which self arises, is variously identified with evil; and, again, the doctrine of the Trinity is never far from Boehme's meaning when he writes of the divine self-destruction. His earliest work, *Aurora* (1612), was denounced from the pulpit, and he was forbidden by the magistrates of Görlitz to write any more. This injunction Boehme obeyed for some years, but finally broke through it. Boehme's collected works were published in Amsterdam in 1675, and again in 1730, and in Leipzig in 1831–46. They were translated into English shortly after his death.

Bœhmeria, a genus of plants of the order Urticaceæ, noted for the production of strong fibres which are made into ropes and sailcloth. *Bœhmeria nivea,* the China Grass, is cultivated in Asia and the warmer parts of Europe and the Americas. It is a shrubby plant, with two forms, one being more robust, and known as rhea or ramie. The fibre is extracted from the stalk by hand-stripping, boiling, or machinery, and is of all fibres least affected by moisture. It is very strong, and can be separated into filaments almost as fine and lustrous as silk; it takes dyes well, and can be woven in fine and beautiful textiles, such as the Chinese grass cloth which resembles linen. It is often used for nets, fishlines, and cordage, and furnishes a superior quality of paper pulp.



Bœhmeria nivea.
1, Female flower; 2, male flower.

Boehm von Bawerk, EUGEN (1851), Austrian political economist, was born in Brünn, Moravia, and studied at the universities of Vienna, Heidelberg, Leipzig, and Jena. He lectured at the universities of Vienna and Innsbruck, and was three times Austrian Minister of Finance. His theory of value is set forth in his book *Kapital und Kapitalzins* (1884–89; Eng. trans. by Smart, *Capital and Interest*, 1890). He considers land and labor as the only actual sources of production, and capital as the only true means of production.

Bœotia, a district of ancient Greece, bounded on the E. by the Eubœan Sea; S. by Attica, Megaris, and the Corinthian Gulf. Its inhabitants were said to be slow and heavy-witted. In the earliest times Bœotia was occupied by a race called the Minyæ, whose chief city was Orchomenus. The Bœotian cities were united in a league, and the history of Bœotia turns chiefly on the attempts made by Thebes to dominate this league. It was only after the battle of Leuctra, in 371 B.C., that the Thebans gained their aim; in 364 they destroyed Orchomenus. The Bœotians bore the brunt of the Greek resistance to Philip at Chæronea in 338 B.C.; and in 335 Thebes revolted against Alexander, and was destroyed, and Orchomenus was rebuilt. Henceforward, Bœotian history is unimportant. See W. Rhys Roberts's *The Ancient Bœotians* (1895).

Boerhaave, HERMANN (1668–1738), a Dutch physician, born at Voorhout, near Leyden. Lecturer (1701), he became (1709) professor of medicine and botany, and (1714–36) rector of the University of Leyden, filling also, from 1718, the chair of chemistry. He was a pioneer in clinical medical instruction. His *Institutiones Medicæ* (1708) had great influence. Of equal merit are his *Elementa Chemiæ* (1724). Boerhaave was the first to lecture in Holland on diseases of the eye. See Burton's *Account of Boerhaave's Life and Writings* (1743), and Johnson's *Life* (1834).

Boers (Dut. *boer*, a 'peasant or husbandman;' connected with Ger. *bauer*, 'peasant'), the farmers in S. Africa descended from the Dutch who founded Cape Colony in 1650. See TRANSVAAL, SOUTH AFRICA.

Boer Wars. See SOUTH AFRICA.

Boëtius, or BOËTHIUS (*c.* 470–524), 'the last of the Romans whom Cato or Tully could have acknowledged for their countrymen' (Gibbon). His full name was ANICIUS MANLIUS SEVERINUS BOËTIUS. He became famous for his learning and knowledge of Greek philosophy and was consul in 510, also chief of the senate. Theodoric, king of the Ostrogoths, made him one of his most powerful ministers. But his protests against the excesses committed by the Gothic officers, and especially his defence of Albinus, who with Symmachus was accused of seeking to liberate Rome, brought him into disfavor with Theodoric. He was accused of treason, sentenced to death untried, and imprisoned in the tower of Pavia, where he produced his great work, the *Consolation of Philosophy.* He was executed in 525. He wrote many works on arithmetic, geometry, logic, and music, which are extant, and translated the principal works of Aristotle. These were the chief source for the knowledge which the middle ages had of Aristotle. A defence of the Christian faith is incorrectly assigned to him. His *Consolation of Philosophy* was translated by Alfred the Great (ed. Fox, 1864) and Chaucer (pub. 1480), and more recently by James (1897). It is a dialogue between the author and Philosophy, in prose and verse. Complete works eds. of Basel (1570), Paris (1860); Peiper, *Consolatio* (1871); Friedlein, *De Institutione Arithmetica et Musica* (1867); Meister, *Commentaria in Aristotelem* (1877–80). See Gibbon's *Decline and Fall;* Bury's *Later Roman Empire* (1889); H. F. Stewart's *Boëthius* (1891).

Bog is spongy land containing considerable accumulations of decayed or decaying vegetable matter (peat). Bogs are most abundant in flat-lying countries, high latitudes, and near the sea, as high rainfall, cold climate, and insufficient evaporation favor their formation. There are many different ways in which they have originated. Some are old lakes which have become partly filled up; others lie in hollows in the surface of the boulder clay, left after the melting of the ice sheets of the Glacial period; others are found in the deserted loops of river channels, or in the half obliterated courses frequent in river deltas. A few are due to subsidence of the surface, owing to removal of underground materials (coal, salt, etc.). Vegetation of a peculiar type is usually abundant—rushes, sedges, grasses, mosses, algæ, and other plants adapted for aquatic conditions. The economic importance of bogs is not great; peat, bog iron ore (q. v.), and bog oak (q. v.) are their most valuable products. When reclaimed by drainage they may yield most fertile soils. See Peat; Bog Plants; Chat Moss.

Bogardus, Anneke. See Jans, Anneke.

Bogardus, bō-gär'dus, Everardus (?–1647), New Amsterdam clergyman, was born in Holland, and was the second minister of New Amsterdam, where he arrived in 1633. He was almost constantly in trouble with Governors Wouter Van Twiller and Kieft, whom he publicly denounced for corrupt practices and intemperance. Both governors made counter charges, and Bogardus was returning to defend himself before the classis in Amsterdam when he was shipwrecked and drowned in the Bristol Channel. His wife was Annetje Jansen, or Anneke Jans (see Jans, Anneke).

Bogardus, James (1800–74), American inventor, was born in Catskill, N. Y. Of his various inventions the best known are the ring flyer for spinning cotton, the dry gas meter (1833), a medal-engraving machine (1836), and instruments used in rubber manufacture and in deep-sea sounding. In 1839 he gained the prize offered by the British government for the best machine for the manufacture of postage stamps.

Bog Asphodel. See Asphodel, Bog.

Bog Bean. See Buck Bean.

Bog Butter (Butyrite or Butyrellite of mineralogists), a peculiar substance, found in some of the bogs of Ireland commonly supposed to have been formed by the decomposition of the peat amidst which it is found, but more probably of animal origin. In composition and qualities it exhibits a general agreement with bitumen, asphalt, amber, and the other mineral resins.

Bogdanovich, bog'da-nō'vech, Ippolyt Fedorovich (1743–1803), Russian poet, famous for his mock-heroic *Dushenka* (1778), based on the story of Psyche. His works were collected in 6 vols. (1810).

Bogert, George H. (1864), American artist, was born in New York. He studied under Thomas Eakins, and later on in France under Puvis de Chavannes and Aimé Morot, receiving the Webb prize in 1898. He also obtained (1899) the Hallgarten prize at the National Academy of Design, and the bronze medal, Paris Exposition, 1900. His work includes both landscapes and marines.

Boggs, Frank Myers (1855), American artist, best known for his marine scenes, was born in Springfield, O., and studied art in the Ecole des Beaux-Arts, and under Gérôme in Paris. The French government (1882) bought for the Luxembourg Museum his *Place de la Bastille*, and (1883) *Isigny* for Niort museum. Other specimens of his work are to be seen in notable French collections, and in museums at Havre, Nantes, and Dieppe. His *A Rough Day, Honfleur*, is in the Boston Museum.

Boghaz-Keui, bō-gäz'kû'i, or Boghaz-Koi (ancient *Pteria*), village, province of Angora, Asia Minor; 90 miles east of Angora. It has remains of an extensive ruined city which is now proved to have been one of the great centres of Hittite civilization. In 1905–7 the ruins were scientifically explored by Winckler and Puchstein, and yielded numerous tablets of great historic interest.

Boghead Coal. See Torbanite.

Bogie, bō'gi, the small truck forming the front part of a locomotive engine (see Locomotive). Bogies are also usually placed under each end of other railway cars.

Bog Iron Ore, a spongy and porous form of limonite (q. v.), frequently found in meadows and bogs. In such situations the water absorbs much carbonic acid from decomposing vegetation, and is thus able to dissolve out oxide of iron from the rocks through which it passes. On emerging to the surface the iron is precipitated in a brown pulverulent mass which may collect in such quantities as to be used as an iron ore. The beds of clay ironstone in the Carboniferous formation have probably been formed in a similar manner. It occurs in Northern Europe and in North America, but is not worked commercially in the United States.

Bog Mosses. See Sphagnum.

Bog Myrtle. See Sweet Gale.

Bognor, bog'ner, watering place, Sussex, England; 9 miles southeast of Chichester. It has an iron pier and an esplanade. Pop. (1911) 8,142.

Bogo, bō'gō, seaport, Cébu, Philippines, on Bogo Bay; 56 miles north of Cébu city; with a good harbor. Pop. 15,000.

Bog Oak, portions of oak trees frequently found in peat bogs, showing that a forest formerly grew where mosses and other marshy plants which form peat have supervened. The wood, though preserving its original structure and grain, is usually black, dense, and difficult to work. It is valued for ornamental purposes; and furniture and ornaments are made from it. Much so-called bog oak, however, owes its dark color to artificial treatment. Remains of birch, hazel, and beech trees are similarly found.

Bogodukhov, bog-o-dōō'kof, or Bohodukhov, town, Kharkov government, Russia; 34 miles by rail northwest of Kharkov. It has tanneries. Pop. 12,000

Bogomiles, bog'ō-milz, or Bogomili (from Slavonic words meaning 'friends of God'), a religious sect of the twelfth century, whose chief seats were in Thrace, Macedonia, and Bulgaria, spreading over Servia, Bosnia, Dalmatia, and Croatia, where its adherents were called *Patarenes*. The teachings of the Bogomiles included the origin of evil in declension from God, salvation through Christ's teaching, the rejection of the sacraments, the use of images in worship, and the rejection of the books of the Old Testament except the Psalms and the Prophets. Severe asceticism was practiced. Basil, one of the leaders, was burned at the stake by the Emperor Alexius Comnenus in 1118, but in spite of much persecution, the sect survived until the Turkish conquest in the sixteenth century.

Bogorodsk, bog-o-rodsk', or Bohorodsk, town, Moscow government, Russia, on an affluent of the Volga; 50 miles by rail northeast of Moscow. Silk, wool, and cotton fabrics and liquors are manufactured. Pop. 12,000.

Bogoslov, bog'o-slōv, or Bogolof, a group of volcanic islets in the Aleutian Islands, Alaska. Sea lions are found.

Bogoslovsk, bog-o-slofsk', township, Perm government; 170 miles northeast of Perm city, Russia. It has a meteorological observatory, and important copper mines and gold workings in the vicinity. Pop. 9,000.

Bogotá, bō-go-ta′, or SANTA FÉ DE BOGOTA′, the capital of the republic of Colombia, and one of the foremost cities of South America, is situated on an elevated plateau (alt. 8,670 feet) in the department of Cundinamarca, at the base of the Guadalupe and Monserrata Mountains, in the eastern range of the Cordilleras; 4° 35′ N. and 74° 13′ W. The climate is mild and agreeable, the temperature ranging between 57° and 61° F.; there are two rainy seasons. The city is separated into four parts by the San Francisco and San Augustín Rivers, crossed by by numerous bridges. In general, the streets are regularly and handsomely built, and there are numerous imposing buildings. Grouped around the Plaza de la Constitución (Bolivar Park), which contains a bronze statue of Bolivar, are the government buildings (including the Capitol) and the Cathedral, a beautiful edifice of the Corinthian order, erected in 1563. In the Independence Park are located the pavilions of textile products, of machinery and mechanics, and of *belles artes*, wherein are exhibited the products and arts of the country. The city is noted for its culture and education, its institutions, including the University of Bogotá (founded 1572), with faculties of letters and philosophy, jurisprudence and political sciences, medicine and natural sciences, mathematics and engineering; National Academy, National Museum, three state endowed colleges, National Library (50,000 volumes), National Observatory, School of Chemistry and Mineralogy, and Botanical Gardens. Other public buildings are the old San Carlos Palace; the new Palace of the High Road, the residence of the president of the republic, the Mint, and two theatres. The city is the seat of an archbishop, and has churches and convents, with paintings by Murillo, Ribera, and others.

Bogotá has railway connection with several neighboring towns, including Soacho (7 miles), Facatitivá (25 miles), Zipaquirá (37 miles), and Girardot, on the River Magdalena (52 miles). Rich mineral deposits occur in the district on the north and east, including iron, coal, salt, limestone, fire clay, manganese, and precious stones. The government salt mines at Zipaquirá are an important source of revenue. The principal manufactures are textiles, pottery, glass, cordage, matches, brewing, flour, and shoes. There are large electric lighting plants and electric railways.

Founded in 1538 by Quesada, the town was called Santa Fé, and in 1598 became the capital of the Spanish viceroyalty of New Granada. Pop. (1912) 121,257.

Bog Plants. The extensive areas, especially in the colder regions of the Northern Hemisphere, which are covered by bogs and marshes have a highly characteristic flora that is distinct from the fully aquatic plants on the one hand, and from the ordinary terrestrial flora on the other. The most important and widely distributed of bog plants are the bog mosses (see SPHAGNUM); but higher cryptogamic plants also occur, notably the horsetails (see EQUISETUM), and occasionally also rarer forms like pilularia. Many sedges and rushes, reeds and grasses, are also highly characteristic, while heaths constantly struggle for possession of the drier and denser spots. The bog myrtle (see SWEET GALE) often overspreads vast areas with its low, scanty brushwood, above which rise only occasional tufts of willow, or at most here and there an alder. The insectivorous plants are perhaps the most characteristic minor denizens, sundews and butterworts being thickly strewn, while the rarer blossoms of the bladderwort rise golden from their stagnant pools.

Bog Spavin, a fluctuating swelling on the inner and front part of the hock of a horse, arising from a distention of the joint capsule with synovial fluid. See HORSE, *Diseases*.

Bogue, VIRGIL GAY (1846–1916), American civil engineer, was born in Norfolk, N. Y. He was graduated from Rensselaer Polytechnic Institute with the degree of C.E. in 1868, was assistant engineer of Prospect Park, Brooklyn (1868–9) and assistant engineer of the Oroya Railway and manager of the Trujillo Railway Company, in Peru. In 1880 he became assistant engineer of the Northern Pacific and during his services in that capacity discovered Stampede Pass, through which he constructed a famous two-mile tunnel. Six years later he became chief engineer for the Union Pacific, and from 1891 until his death was in independent practice. He was a member of the commission appointed by President Harrison to investigate methods for improving the Columbia River and consulting engineer for the Government of New Zealand on the railroad across South Island.

Bogue Forts. See CANTON RIVER.

Boguslav, bō′gu-släf′, ancient town, Kiev government, Russia, 70 miles southeast of Kiev. It has cloth manufacture and trade in wool, leather, and sheep skins. Pop. 9,000.

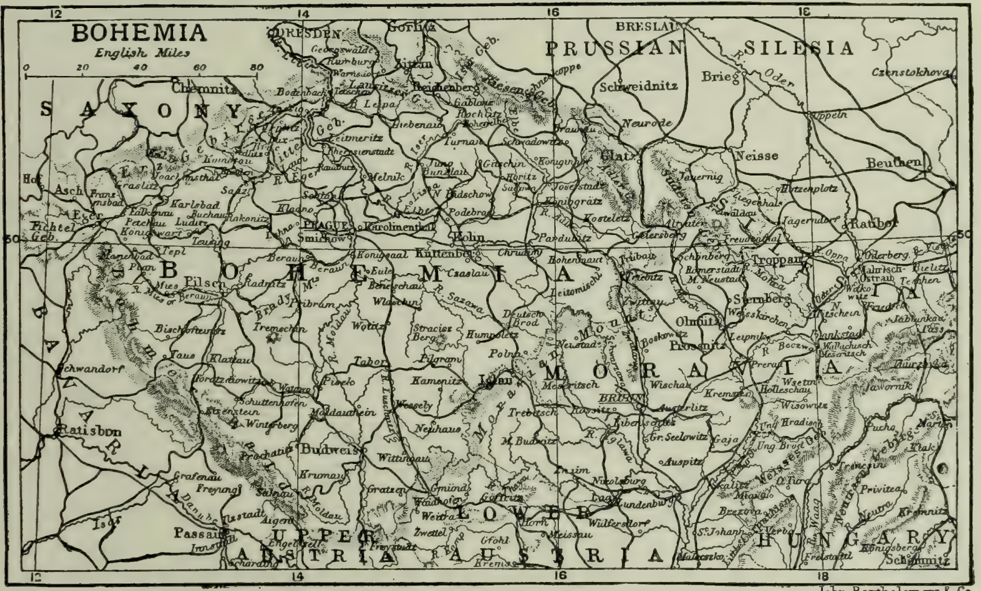
Bogutschutz, bō′go͞ot-shüts, town, province Silesia, Prussia, immediately northeast of Kattowitz, with coal mines and zinc furnaces. Pop. (1910), 22,923.

Bohain, bō-aṅ′, town, department Aisne, France; 13 miles northeast of St. Quentin. It has brewing, tanning and dyeing industries. During the World War (1914–19) it was occupied by the Germans, who used it as a centre for detraining troops and stores, and who left it in ruins in their retreat before the Allied advance that ended the war. Pop. (1911) 6,877.

Bohemia (Bohemian *Chekhy* or *Cechy*; German *Böhmen*), formerly a kingdom of the Austrian Empire, forming since 1918 a constituent part of the new Czechoslovak Republic (q.v.). It is bounded by Saxony on the north, Bavaria on the west, Silesia on the northeast, Moravia on the east, and Upper Austria on the south. Its area is about 20,065 square miles.

Bohemia is fenced in by lofty mountain ranges—the Bohemian Forest on the southwest, the Fichtelgebirge and Erzgebirge on the northwest, and the Isargebirge, Riesengebirge, Adlergebirge, and other chains of the Sudetic system on the northeast. A broad but relatively low hilly region, constituting the watershed between the Elbe and the March, marks it off from Moravia; and the determining feature of the interior is the River Elbe. From the Bohemian Forest the surface slopes toward the Elbe in a series of terraces and hilly plateaus trenched by the Moldau and its tributaries. The only level tracts are the small expansions of the river valleys—*e.g.*, at Prague, Pilsen, and Budweis. The climate resembles that of the interior of Germany, but is more severe in the mountainous parts on the borders than in the lowlying Elbe valley. The mountain peaks are snow-covered most of the year. The annual mean temperature is 46½° F.

With a fertile soil, an industrious population, and abundant mineral deposits, Bohemia's resources are extensive. Forests cover 29 per cent. of the surface; the remainder is under cultivation or under grass. Cereals thrive in the lower northern districts, potatoes and oats in the higher grounds. Beet root is extensively grown for sugar. Cattle raising is carried on extensively, and in the South geese are an important source of wealth. The most important minerals are coal and lignite, silver, iron, and graphite, with lead, tin, antimony, and gold. The lignite mines stretch along the foot of the Erzgebirge from Aussig to Eger, and produce annually some 18,000,000 tons; while the bituminous coal mines, most of them around Kladno (west of Prague) and Pilsen, yield over 7,000,000 tons. Iron ore is mined near Prague, Pilsen, and Falkenau, to the extent of 700,000 tons per annum; of this, some 300,000 tons of pig iron are smelted at Prague and Pilsen. The mining of gold was revived in 1903, the principal mines being at Mount Roudny and at Krasna Hora. Along the northwest border are the well-known mineral springs of Karlsbad, Marienbad, Franzensbad, Teplitz, Bilin, Johannisbad, and Sedlitz.



John Bartholomew & Co.

The most important industry is sugar manufacturing; over 500,000 tons of raw sugar being produced yearly. Cloth and other woollen goods are manufactured at Reichenberg, Aussig, Friedland, and Asch; cotton goods at Prague, and generally from Reichenberg westward to Brüx; carpets at Reichenberg and Eger; linens at Trautenau, Schönberg, and Hohenelbe; beer at Pilsen, Budweis, and Eger; glass at Prague, Eger, Pilsen, Gablonz, and Karlsbad. About 200,000,000 gallons of beer are brewed annually, that of Pilsen and Budweis having a worldwide reputation, and the glass trade has been in a flourishing condition since its introduction from Venice in the thirteenth century, Bohemian glass being universally known for its beauty. Of less importance are distilling, engineering, paper making, and printing. Bohemia is the centre of an active trade, and the Elbe is of the greatest importance as a means of communication.

The Bohemians, or Czechs (Chekhs), are mostly of Slav stock, and have been settled in the country since the fifth century. About 37 per cent. of the population is of German descent, mostly town dwellers, and between them and the Czechs—mainly the peasants and aristocracy—there exists a bitter race enmity. About 96 per cent. of the entire population is Roman Catholic; 1½ per cent. is Jewish. At the end of the Thirty Years' War (1648) Bohemia had barely 800,000 inhabitants; in 1772 she had 2,314,795; in 1857, 4,705,527; in 1910, 6,774,309, and in 1913, 6,820,610 (est.), giving 338 to each square mile over the total area of 20,052 square miles. The capital is Prague (q.v.), the seat of the oldest of the German universities, founded in 1348. Other large towns are Pilsen, Budweis, and Aussig.

History. — When Bohemia (with which we here include Moravia) is first mentioned in history we find it occupied by the Boii, a Celtic tribe; hence the name Böhmen (German *heim*, or home, of the Boii). The Boii were overcome (first century B.C.) by the Marcomanni; and when the latter had been crushed by other tribes, the Slavonic Czechs made their appearance (about 450 A.D), and have since occupied the country.

The Bohemians are supposed to have been tributary to Charlemagne. Christianity was introduced among them by Cyril and Methodius in the ninth century, and for a period they fell under the dominion of Svatopluk, the great monarch of Moravia. Little is actually known of their history, however, till the time of Wenceslaus I. (Vaclaw), who was crowned king in 1230. His son, Premysl Ottokar II (1253–78), undertook an expedition against the heathen Prussians, many of whom were converted. He defeated the Hungarians with great slaughter in 1260, and was himself eventually defeated and slain (1278) by Rudolph of Hapsburg, near Marchfeld. He was succeeded by his son Wenceslaus II. (1283–1305), who died suddenly in the midst of preparations to invade Austria; and he by his son Wenceslaus III., whose assassination at Olmütz a year later ended the male line of the dynasty of Premysl.

After the very short and fruitless reigns of another Rudolph of Hapsburg and Henry of Carinthia, the choice of the Bohemians fell upon the only son of the German Emperor Henry VII., John of Luxemburg, who was succeeded by his son Charles IV. (1346–78), a great lover of the Bohemian language, and the founder (1348) of the University of Prague. Charles was followed by his son Wenceslaus IV. (1378–1419), whose reign is notable for the beginning of the religious movement led by John Huss (q.v.), which, strongly leavened with nationalist aspirations, resulted in the Hussite War (See HUSSITES, WAR OF), and continued to agitate the country for nearly a hundred years. In 1419 Wenceslaus was succeeded by his brother Sigismund, who, like his two predecessors was also Emperor of

Germany. The reformers led by John Ziska (q.v.) refused to recognize the new sovereign, but a compromise was eventually reached and he entered Prague in 1436.

Albert, Duke of Austria, Sigismund's successor, reigned for only two years (1437–9), and upon the death of his posthumous son Ladislaus, George Podiebrad (q.v.), who had proved himself an excellent regent, was unanimously chosen (1458) king by the Bohemian Estates. He was regarded with the greatest abhorrence by Pope Paul II.; and was engaged in continuous fighting with Matthais Corvinus, the vigorous king of Hungary, whom he succeeded in driving completely out of Moravia. His successor, the Polish prince Ladislaus (1471–1516), was elected (1490) to the throne of Hungary, and removed the royal residence to Ofen, where his son and successor, Louis (1516–26), also resided. After the death of the latter in the battle against the Turks, led by Sultan Solyman at Mohacz, Bohemia and Hungary passed into the hands of Ferdinand I. of Austria, who had married Louis' sister.

From this time forward the history of Bohemia merges in that of Austria. In 1547 Ferdinand crushed a movement for the restoration of certain ecclesiastical and political liberties which had been usurped by the king, and in 1556 he introduced the Jesuits, who had a great reactionary influence upon the country. He died in 1564, and was succeeded by his son Maximilian (Emperor Maximilian II.), who had a short but troubled reign. Maximilian was succeeded by his son Rudolph, who also became German Emperor (Rudolph II.) and king of Hungary, with his residence at Prague, which thus practically became the capital of the Austrian dominions. Rudolph ultimately was compelled by his subjects to grant (1609) the celebrated Letter of Majesty, which ensured religious toleration, and this was confirmed by his successor Matthias, and later by Ferdinand II., whose election to the Bohemian throne Matthias had secured. Ferdinand's toleration of Protestantism, however, was mere pretence; the religious struggle was soon renewed; and on May 23, 1618, occurred the so-called defenestration whereby Slawata and Martinitz, Ferdinand's representatives at Prague, were seized by the patriotic Protestant party and flung out of the windows of the palace, an event which precipitated the war that was to desolate Bohemia and all Germany for thirty years. (See THIRTY YEARS' WAR.)

In 1619 Ferdinand was formally deposed by the Bohemian Estates, and Frederick, the Protestant Elector Palatine, was chosen in his stead. The new king, however, was unequal to the task that confronted him, and after the Battle of White Mountain fled, leaving his followers to their fate. Many of the leading Protestants were executed, others were driven into exile, and their lands confiscated; the political and religious liberties of Bohemia were destroyed, and even the national language began to decay. Over a hundred and fifty years later religious freedom was restored by the Edict of Toleration in the reign of Joseph II. (1780–90).

Revolutionary movements agitated the country in 1848; and the ensuing years were marked by increasing rivalry between the Czechs and Germans and by almost continuous agitation by the young Czech party for political autonomy. The Great War (q. v.) brought these dissensions to a climax. The reluctance of the Bohemians to fight for the Central Powers led to serious repressive measures, and on Oct. 28, 1918, revolutionists seized Prague. In the meantime Czech and Slovak emigrants had organized (1916) a Provisional Government abroad, with headquarters at Paris. The two movements combined, and Bohemia became thereby a part of the new Czechoslovak State (See CZECHOSLOVAK REPUBLIC).

Consult Monroe's *Bohemia and the Czechs* (1910); Capek's *Bohemia under Hapsburg Misrule* (1915); Nosek's *Independent Bohemia* (1918).

Bohemia: Language and Literature.—The Bohemian language belongs to the western branch of the Slavonic languages, and is closely connected with Slovakish, which is spoken in the northern parts of Hungary. Bohemian literature may be divided into three leading periods—(1) from the beginning till the Hussite wars (1410); (2) from the time of Huss to the latter part of the eighteenth century; (3) from the renaissance of the literature to the present day.

The earliest productions are religious in character. The Greek Church is represented by a Glagolitic fragment (*c.* 900), the Latin by a fragment of St. John's Gospel, with an interlinear Bohemian translation of somewhat later date. The greater part of the Bible was translated by the end of the thirteenth century, and in the fourteenth the whole was complete. The Latin *Alexandrëis* was freely translated into Bohemian between 1240 and 1250, and legends of Christ and several saints were current towards the close of the century. To the fourteenth century belongs the chronicle called after Dalimil, although the real name of the author is unknown. It is in verse. Some clever satires were written by Smil of Pardubitz, surnamed Flaska, who was killed in 1403. To this period also belong *The Book of the Old Lord of Rosenberg* (*Kniha Stareho Pana Rozenberka*), one of the earliest specimens of Bohemian prose; and the *Exposition of the Law*, by Andrew of Duba. Pulkava, a priest, who died in 1380, wrote another prose chronicle; and here must be mentioned the *Weaver* (*Tkadlecek*), in which the anonymous author celebrates the beauty of a certain Adelicka. Thomas of Stitny, who writes on religious and moral topics, is the great Bohemian author of the fourteenth century. His prose is remarkable for the period.

The second period begins with the name of Huss, who did a great deal to settle Bohemian orthography, and to develop Czech literature. Some of his writings are in Latin, but he left a fair number in Bohemian. Peter Chelcicky (1390–1460), a pupil of Huss, wrote a celebrated work, the *Net of Faith* (*Sit Viry*). In 1487 the first regular printing press was set up at Prague, and the Bible was printed there in the following year. Some interesting volumes of travels were published. Gelenius and Veleslavin (1546–99) worked as humanists, and did much to spread the Renaissance in Bohemia. Hajek (1495–1553) wrote a curious chronicle, *Kronyka Czeká*, with which he incorporated all the early Bohemian legends, so that his history is more amusing than reliable. Harant published his travels in the Holy Land, and we have the narrative by Wenceslaus Vratislav of Mitrovitz and his captivity at Constantinople. John Amos Komensky (more familiar to Englishmen in the Latin form of his name, Comenius) composed his valuable works on education, in exile. He died in Holland in 1670 (born in 1592).

It was not until nearly the close of the eighteenth century that a revival of Bohemian literature took place. It began with Joseph Dobrovsky (1753–1829), who wrote a grammar of Czech and an epoch-making work on Old Slavonic (Vienna, 1822). Jungmann (1773–1847) compiled a valuable dictionary, and Kollar (1793–1852) and Celakovsky (1799 – 1852) gained reputation as poets. In our own days Bohemian literature has been greatly developed. Palacky (q. v.) was the author of the great national history completed in German in 1867 and in Bohemian in 1876. His literary labors were carried on by Tomek and Gindely (q.v.). Other historians of note are Joseph Kalousek, Constantine Joseph Jirecek, author of a history of Bulgaria, Dr. Resek, Cenek Zibrt, Josef Emler, J. Pekar, and Karel Erben.

Among the most celebrated poets are Jan Vrchlicky (1853–1912), a voluminous writer, Sladek (1845–1912), Halek (1835-74), Zeyer (1841–1901), Henrietta Pech, whose works appear under the name of Eliska Krasnohorska; Svatopluk Cech (1846–1908), one of the greatest of modern epic poets; Josef Machar (1864); Frantisek Svoboda (1860); Neruda (1834–91); Sova (1864); Bezruc (1867), and Brezina (1868), the three last being authors also of admirable works in prose.

The first to collect the folktales of the country was Bozena Nemcova (1820–62), while Schafarik (1795–1861) was the first to treat scientifically the ethnology of the Slavonic races. His book is familiar to most students in the German translation *Slawische Alterthumer* (1837). Other prose writers of note are Karolina Svetla (1830–99), Rais (1859), Sezima (1876), Klostermann (1848), Simacek (1860), Salda (1867), Capek (1890), and Srámek (1877).

Bohemian Brethren. See Moravians.

Bohemian Forest (Ger. *Böhmerwald*), a mountain range separating Bavaria from Bohemia, stretches from the Fichtelgebirge south to the Danube, some 150 miles, reaching its maximum elevation in Great Arber (4,785 ft.) and Rachel (4,770 ft.), though the average altitudes lie between 2,500 and 4,500 feet. With the exception of the highest summits, the range is covered with dense forest. It is crossed, at altitudes varying from 1,600 to 3,400 feet, by three railways and four roads, the best known being the 'golden ladder' from Passau to Strakonitz. The German and Czech inhabitants engage chiefly in agriculture and the pasturage of live-stock, made profitable by the abundant rainfall.

Bohemond I., bō'hē-mond (c. 1056–1111), prince of Antioch, was the eldest son of Robert Guiscard (q. v.), under whom he served with distinction in the war (1081–5) against Alexius Comnenus, emperor of Byzantium. He took a distinguished part in the first crusade (1096), captured Antioch (1098), of which he became prince, but was himself captured (1100) by the Turks and imprisoned for three years, during which his cousin Tancred (q. v.) looked after his interests in Antioch. He married a daughter of Philip of France, and with a French army renewed unsuccessfully the war (1107–8) against Alexius. He died at Canossa, in Apulia. In the sovereignty of Antioch he was succeeded by six princes of his name, the principality being destroyed by the Mamelukes in 1268.

Bohlen, bō'len, Peter von (1796–1840), German Orientalist, was born in Oldenburg. In 1822–4 he attended A. W. von Schlegel's lectures on Sanskrit at Bonn, and in 1828 became professor of Oriental languages in the University of Königsberg. Among his principal works are *Das alle Indien* (2 vols., 1830); *Ueber den Ursprung der Zendsprache* (1831); and translations of two Sanskrit poems in the original metre—*Bhartriharis Sententiæ* (1833), and *Ritusanhara, sive Tempestatum Cyclus, Carmen Kalidasi* (1840). Consult his *Autobiographie* (1841).

Böhme. See Boehme, Jakob.

Böhmen. See Bohemia.

Böhmer, bû'mer, Eduard (1827–1907), German philologist and theologian, was born in Stettin. He became professor of Romance philology at Halle in 1868, and at Strassburg in 1872. His publications include an edition of Spinoza's *Tractatus de Deo et Homine* (1852); *Ueber die Apokalypse* (1855); *Das erste Buch der Thora* (1862); *Ueber die Provençalische Poesie der Gegenwart* (1870); an edition of the poem of Roland under the title *Rencesval* (1872); *Pindar's Sizilische Oden mit Prosübersetzung* (1892). He edited also the review *Romanische Studien* (5 vols. 1871–80).

Böhmerwald, bû'mer-vält. See Bohemian Forest.

Böhmisch-Leipa, bû'mish-lī'pa, town, Czechoslovakia; 40 miles northeast of Prague. It has railway work shops, calico printing, and other industries. Pop. (1921) 11,753.

Böhmisch-Trubau, trû'bow, town, Czechoslovakia; 32 miles southeast of Pardubitz. It has textile industries. Pop. (1921) 8,389.

Bohn, bōn, Henry George (1796–1884), English publisher and author, was born in London, the son of a Westphalian bookbinder. In 1841 he issued his famous 'guinea catalogue' of books, containing 23,208 items, and in 1846 he began the cheap issue of notable books with which his name is chiefly associated. Besides the *Origin and Progress of Printing* (1857), and the *Biography and Bibliography of Shakespeare* (1863), which he wrote for the Philobiblon Society, Bohn compiled several works for his 'Libraries,' edited Lowndes' *Bibliographer's Manual* (1857–64), and published his own translations of Goethe, Schiller, Humboldt, and Petrarch.

Bohol, bō-hōl', island, of the Visayan group, Philippine Islands, lies between the southern end of Leyte and Cebú Islands, 70 miles north of Mindanao Island, in latitude 9° 50′ N., and longitude 124° 15′ E. It is a coral island, about 55 miles long, by 30 miles wide, with an area of approximately 1,441 square miles. There are no good harbors, and the north and east coasts are rendered difficult of approach by dangerous reefs.

The island has no marked elevations. In the south there are hills, but in the north the surface is either level or undulating, in few places exceeding 1,000 feet. There are four or five large rivers navigable by the native cargo boats, and some smaller streams which are often dry after the end of the rainy season (May to January). The heaviest rains occur from August to November.

Agriculture is the chief occupation, 175,000 acres of the great plateau of the interior being under cultivation. The principal products are rice, corn, sugar and copra. The weaving of cloth and blankets is an important industry; mats, raffia and nito hats, and baskets are made. With its outlying islands, Bohol constitutes the *Province of Bohol.* Area 1,511 square miles. Pop. (1918) 358,387. See Philippine Islands.

Bohr, Niels (1885–), Danish scientist, was born in Copenhagen. He was educated at the University of Copenhagen, where he became professor of physics in 1916, and in 1920 director of the institute of theoretical physics. In 1922 he received the Nobel Prize in physics for his theory of the structure of the atom, which he likens to the solar system (see Atom). In 1923 Professor Bohr lectured at various universities in the United States.

Böhtlingk, bet'link, Otto (1815–1904), Russian Sanskrit scholar, was born in St. Petersburg, Russia. From 1835 to 1842 he studied oriental languages, especially Sanskrit, at Berlin and Bonn; and, after twenty-six years in his native city, settled in 1868 at Jena, and in 1885 at Leipzig. Among his works are the first European edition of the Indian grammarian Panini (1839); a Sanskrit Chrestomathy (1845; 2nd ed. 1877); and a Sanskrit dictionary (7 vols. 1855–75), in collaboration with Professor Rudolph Roth.

Boiardo, bō-yär'dō, Matteo Maria (1434–94), Count of Scandiano, Italian poet, was born in Scandiano, and educated at the University of Ferrara. He was appointed governor of Reggio in 1478, of Modena in 1481, and again of Reggio in 1487, retaining that position until his death. His fame as a poet rests chiefly upon the *Orlando Innamorato*, a long narrative poem in which the romances of the Carlovingian cycle are recast in octave stanzas. He also showed himself a worthy follower of Petrarch in his *Amorum Libri Tres*(1499), and in five allegorical eclogues written in 1471–2. He further translated from Herodotus, Xenophon, Apuleius, and Cornelius Nepos, and dramatized Lucian's *Timon* (1500). The first two parts of the *Orlando* appeared at Venice in 1486; the three parts complete at Scandiano in 1495. Ariosto (q. v.) continued the story of Boiardo's masterpiece in his *Orlando Furioso*.

Boieldieu, bō-yel-dyû′, FRANÇOIS ADRIEN (1775–1834), master of the French school of comic opera, was born in Rouen. He studied under Cherubini in Paris, where he was appointed to a professorship in the Conservatoire, and spent most of his life in the French capital, though he was in St. Petersburg from 1803 to 1810. Of his numerous works the most popular are *Le Calife de Bagdad* (1799), *Jean de Paris* (1812), and *La dame blanche* (1825), his *chef-d'œuvre*. He possessed a charming gift of melody, and his instrumentation, though light, is always full of grace and refinement. Consult Ferris' *Great Musical Composers*.

Boii, bō′i-ī, a Gallic tribe which at an early date crossed the Alps, and settled partly in Italy, between the Po and the Apennines, and partly in Germany, in Bohemia (which derives its name from them), and between the Danube and the Tyrol. After many wars the Romans finally subdued the Italian Boii in 191 B.C.; the German Boii were expelled, at the end of the first century B.C., by the Marcomanni.

Boil, a circumscribed suppurative inflammation of the skin, or of subcutaneous connective tissue, or of a gland, with the formation of a core of dead tissue. It usually begins as a small hard point of a dusky red color, which is hot, painful, and throbbing. This point extends, and the symptoms increase in severity till sooner or later, when the boil ceases to enlarge, it is of a conical form, with a broad firm base, and on the apex a whitish blister, containing a little pus. This opens, and after a few days the core is discharged, and the small cavity heals rapidly, leaving a white depressed scar. Boils sometimes subside without any breach in the skin, or any discharge. These are known as *blind boils*.

Boils are probably always caused by some abnormal condition of the blood or the nutrition of the body, though they often occur in people who appear to be in good health. They are most common in spring; are rare in young children and most frequent in older children and young adults. They often occur also during recovery from exhausting diseases. The micro-organism *Staphylococcus pyogenes* is often present.

The best application for a boil in the early stages is collodion, frequently repeated, which often prevents its further development. Later, when the pain is severe, frequent bathing with hot water, or the application of small hot poultices, will give relief and hasten the progress of the case. Incision is sometimes advisable if the patient's suffering is great. The constitutional condition must always receive attention, and any error in diet or habits corrected. Obstinate cases have been successfully treated by vaccine therapy (q. v.).

Boileau-Despréaux, bwä-lō′-dā-prā-ō′, NICOLAS (1636–1711), French poet and critic, was born in Paris. He published his satirical *Adieux d'un Poète à la Ville de Paris* in 1660, and in 1663 he was united with Molière, La Fontaine, and Racine, in the famous 'society of four.' Boileau gained the favor of the king, who in 1677 appointed him, along with Racine, royal historiographer. *L'Art poëtique* was published in 1674, with four cantos of the *Lutrin*, a clever serio-comic description of an ecclesiastical squabble over a reading-desk. Two cantos, concluding the poem, appeared in 1681. Between 1669 and 1677 Boileau published nine epistles, written, like his satires, on the Horatian model. His works include several critical dissertations in prose, a collection of epigrams, a translation of Longinus, *On the Sublime*, a *Dialogue des héros de roman*, and a series of letters, a number of which are addressed to Racine, extending from 1672 to 1710.

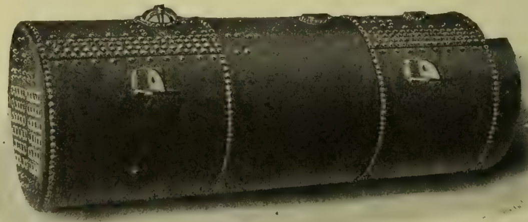


FIG. 1.—*Atlas Return-Tubular Boiler*

Through the influence of Boileau more than any other, French prose became clear, precise, and polished composition, but lost its old pith, color, and flexibility. Boileau's influence has thus been both beneficial and hurtful to French letters. For more than a hundred years he was accepted by his countrymen as the infallible 'lawgiver of Parnassus.' His authority has been reduced to a closer conformity with his deserts since the rise of the French Romantic school.

Consult Fournier's edition of Boileau; also the edition by Gidel, and Laverdet's *Correspondence de Boileau*.

Boiler. A steam boiler is the combination of a furnace in which fuel is burned and a closed vessel in which steam is generated. The combustion of the fuel—solid, liquid, or gaseous—in the furnace produces hot gases that act as carriers of heat to the various parts of the heating surface through which the heat is transmitted to the water by conduction. It is essential that the furnace should have sufficient volume to allow thorough mixing of the air and the combustible gases to the end that combustion may be completed before the resulting gaseous products of combustion are brought in contact with the heating surfaces of the boiler. If this precaution is not observed, the combustion is incomplete, there is waste of fuel, and probably the formation of soot and smoke. Much of the heat absorbed by the water is transmitted by radiation from the incandescent fuel and the highly heated furnace walls to those parts of the heating surface directly surrounding the furnace. The area of heating surface should be ample to absorb the heat so that the products of combustion may be rejected at as low a temperature as practically possible, which of course must be higher than the temperature of the water in the boiler. The heating surface comprises those portions of the boiler which are in contact with the hot gases on one side and with water on the other.

Return-Tubular Boiler.—The most common type of boiler in use in the United States is the horizontal return-tubular boiler, one form of which is shown in Fig. 1. Such a boiler consists of a cylindrical shell, the length of which is four or five times the diameter, with flat heads supported by stays and connected by a large number of tubes of diameters varying from 3 to 6 inches in different makes of boilers. The boiler is supported in a horizontal position by a brick setting, which also supports the grate under one end of the boiler, as shown in Fig. 2. The gases of combustion are caused to travel along the under surface of the boiler over its entire length and then return through the internal tubes, escaping through a breeching placed vertically above the fire-door. In this way about one-half of the surface of the shell and all of the tubes are useful in transmitting heat. The merits of this type of boiler are cheapness and simplicity. Its disadvantages are the difficulty of cleaning scale and other deposits from the interior and great destructiveness in case of explosion.

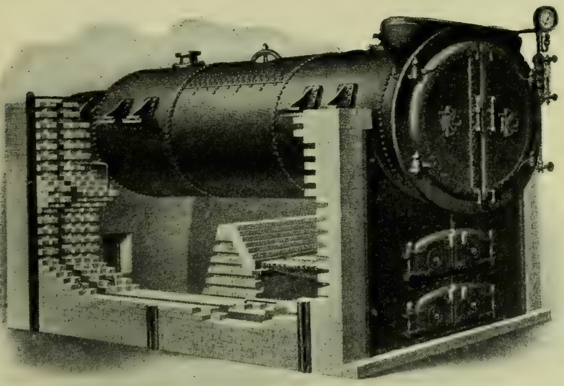


Fig. 2.—*Bigelow Horizontal Return-Tubular Boiler*

As long as the amount of steam to be obtained per square foot of boiler heating surface is low the horizontal return tubular boiler is to be preferred, as it is easy to handle and the efficiency is equal to that of the other boilers. But when the output of a single boiler gives over 7,000 lbs. per hour, the water tube type is the favorite, as it gives a high capacity, per unit of space occupied and per square foot of furnace volume.

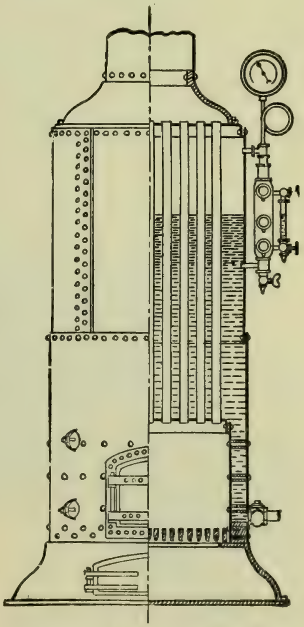
The return-tubular boiler is seldom built for pressures over 175 lbs. since high pressures entail thick shell plates which are liable to blister due to poor heat transfer and laminations in the sheet.

Vertical Boilers.—Vertical boilers may be of either the fire-tube or the water-tube type. An example of the fire-tube type is shown in Fig. 3. The furnace is located inside the shell and is surrounded by water except at the bottom. The annular space between the walls of the furnace and the outside shell is known as the water leg. Tubes lead from the furnace vertically upward to the smoke-box and the hot gases produced by combustion rise through these tubes and escape from the smoke-box to the chimney. Heat is transmitted to the water by radiation to the furnace walls, and by conduction through these walls and through the tubes. The steam space of this type of boiler surrounds the upper ends of the tubes. The parts of the tubes extending through the steam space form superheating surfaces. But if the boiler is steaming at a fair rate the ebullition at the water surface is so violent that the steam filling the upper part of the shell is more or less wet. Consequently superheating does not occur, but the exposed tube ends dry out the wet steam.

Vertical fire-tube boilers are usually built in small sizes of from 4 to 50 horsepower, although the Manning type fire-tube boiler is built up to 300 hp. and for years was largely used in textile mills. They are completely self-contained, require no brick setting, and may be shipped ready for use. Fire engines are of this type, but the vertical fire-tube boiler is also extensively used to furnish steam for small engines and for operating steam hoists such as those employed by contractors. The pressure carried is usually less than 100 lbs. per square inch, but boilers of this type can be built for higher pressures.

Locomotive Type.—This boiler, as shown in Fig. 4, consists of a rectangular fire-box attached to a cylindrical shell called the barrel, which extends horizontally from the fire-box to the front part or smoke-box end of the boiler; the fire-box is connected to the smoke-box by a number of tubes, through which the products of combustion pass on their way to the chimney. The fire-box is enclosed completely within the body of the boiler, and consequently the four sides, and also the top or crown, are available as heating surface, which is greatly augmented by the tubes traversing the water space in the barrel. The sides and top of the fire-box, being flat, would quickly collapse under the pressure of the steam, unless special provision, in the shape of stays, was made to stiffen and support them. The tubes, in addition to acting as flues and heating surface, fulfil also the function of stays to the flat end of the barrel of the boiler, and to the portion of the fire-box opposite to it.

This type of boiler is widely used for portable power plants on construction work and in the oil fields. It also finds wide application in apartment house heating, in which event it is usually supplied with a down-draft grate, so that smokeless operation is possible.



Courtesy of McGraw-Hill Book Co.

Fig. 3.—*Vertical Fire-Tube Boiler*

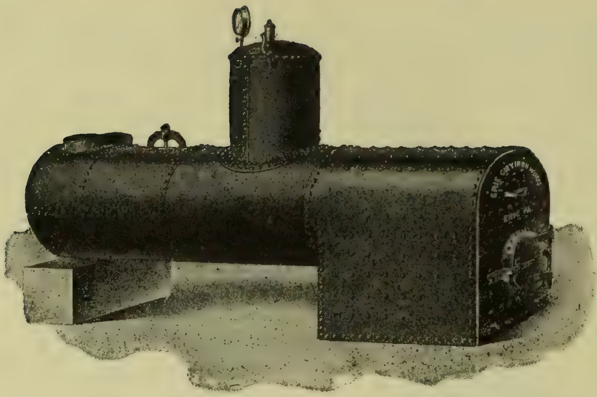


FIG. 4.—*Locomotive Portable Boiler, Erie City Iron Works*

Marine Boilers.—The Scotch marine boiler is extensively used in marine practice. It is a horizontal, internally fired, fire-tube type of boiler, consisting of a cylindrical shell from 6 to 16 feet in diameter and of approximately equal length. Inside the shell are placed the corrugated furnace flues, which may be from one to four in number. If furnaces are placed in both ends of the boiler, it is said to be double-ended. At the rear end the furnace flue opens into a vertical combustion chamber, whose sides are stayed to the outer shell for support. From the upper end of the combustion chamber a nest of tubes leads forward to the front head of the boiler. The hot gases from the fire on a grate in the front end of the furnace flue pass to the rear into the combustion chamber and then back to the front through the tubes, escaping at the front into a suitable breeching by which they are led to the stack.

The dry-back Scotch marine boiler, is shown in Fig. 5. The boiler pictured has the back of the combustion chamber 'dry,' or not surrounded by water.

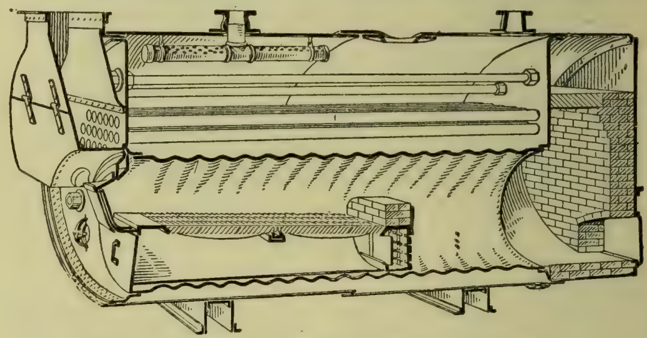


FIG. 5.—*Section of Dry-back Scotch Marine Boiler*

Many Scotch boilers have a 'wet' back. The main difference lies in the fact that in the former the combustion chamber at the rear of the furnace flue is lined with firebrick at the back, laid up against a flat head riveted to an extension of the main shell. Thus, the combustion chamber is not surrounded by water, whence the name given to the boiler.

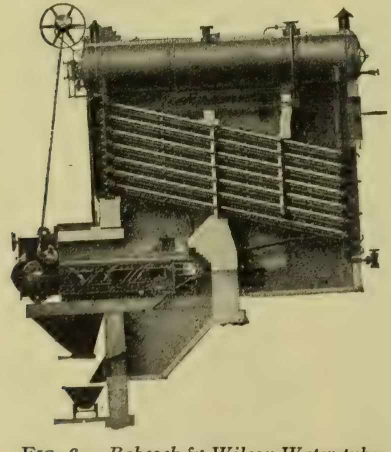


FIG. 6.—*Babcock & Wilcox Water-tube Boiler*

Water-tube Boilers.—In boilers of this type the steam is generated from water contained in thin tubes of small diameter, by heat applied to the outside of the tubes. Circulation in water-tube boilers is mainly produced by the difference in density of the ascending and descending currents of water. In this type of boiler a small quantity of water covers a large area of heating surface, and a rapid circulation is necessary to carry off the heat absorbed by the generating tubes, which should be arranged to facilitate the free escape of the steam.

There are many forms of water-tube boilers, some with vertical tubes and some with inclined tubes.

The inclined-tube boilers make use of either a series of sinuous headers that nest together to form the main front and rear headers, Fig. 6, or the front and rear headers may be of one-piece plate construction, the 'box' type Fig. 7.

The Babcock & Wilcox boiler, one form of which is shown in Fig. 6, belongs to the inclined-tube class. The tubes are straight and are expanded at their ends into forged steel boxes known as headers. The combination of a front and a rear header and their connecting tubes forms a section. A number of these sections are set side by side, with the tubes inclined downward from front to rear, and the headers are joined by pipes to an overhead horizontal drum. The headers are not straight, but are of a zigzag shape, and the tubes in a single section are staggered instead of lying in the same vertical plane. Thus, when the sections are placed side by side, the tubes in each horizontal

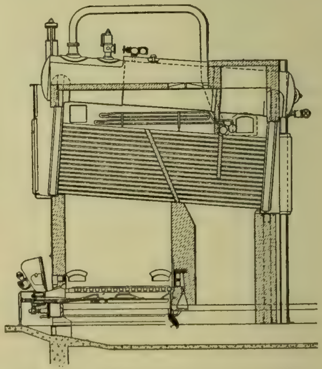


FIG. 7.—*Heine Box-header Boiler*

row are directly over the spaces between the tubes in the row directly below.

The drum and the sections connected to it by pipes are suspended from a steel framework by stirrups that pass beneath the drum near the ends, and the whole is enclosed in a brick setting so as to form a furnace chamber and passages for the hot gases. The brickwork immediately surrounding the furnace and combustion spaces is made of refractory materials so as to withstand successfully the high temperatures produced.

The box-type inclined-tube boiler Fig. 7 is in general principles identical with Fig. 6, but as has been stated the front and rear headers are made of steel plates, box-like in form. The plate toward the tubes is dulled to receive the tube ends, which are expanded, or rolled, in place. Opposite each tube or pair of tube ends, an opening is cut in the outside plate of the header to afford access to the tube.

The fuel is burned on a grate situated below the front ends of the tubes. The grate bars are supported by transverse bearer bars, and at the rear of the grate is a brick pier called a bridge wall, the purpose of which is to prevent the fuel from falling off the rear end of the grate, as well as to force the hot gases to rise through the tubes at the front. Baffles, consisting of firebrick partitions built transversely across the tubes above the bridge wall and at a point midway between the bridge wall and the rear end, compel the hot gases to take a circuitous path in traveling from the furnace to the chimney. In this particular case the gases are forced to pass across the tubes three times.

The tubes are inclined in order to provide rapid circulation of the water. Since the water in the tubes has a higher temperature than that in the drum above, and therefore weighs less per cubic foot, the lighter water tends to rise and the heavier to descend.

Opposite the ends of the tubes in the headers are openings through which the tubes may be cleaned. Under normal operation these holes are closed by handhole plates that are held in place by clamps and bolts.

It will be noticed that the drums in both Fig. 6 and 7 are placed longitudinally. The water rises up the header over the furnace, and the entrained steam bubbles are released in the water space immediately above the header opening. The water then flows back to the rear header, down the header and forward through the tubes where it picks up heat from the combustion gases, and as a mass of water mixed with steam bubbles, enters the front header.

It will be seen that the surface when the steam bubbles disengage from the water is equal approximately to the cross section area of the opening between the front header and the drum. At high rates of evaporation the stream of steam and water from the front header 'geysers' into the header, and water is carried along with the steam into the steam main. This is a serious objection, especially in large boilers.

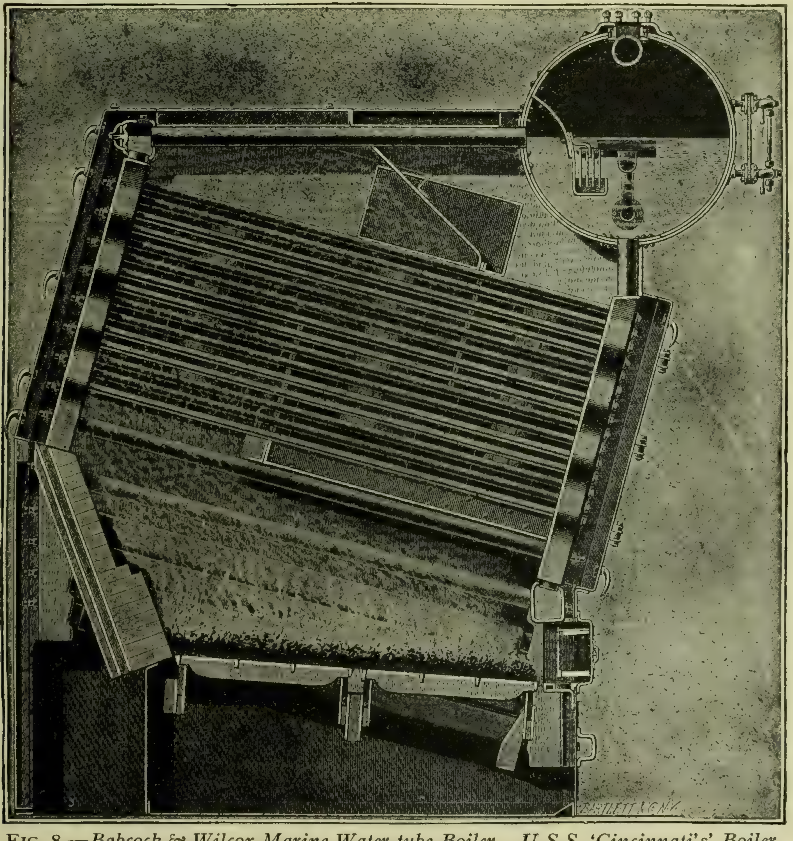


FIG. 8.—*Babcock & Wilcox Marine Water-tube Boiler. U.S.S. 'Cincinnati's' Boiler. Section Showing Path of Gases*

Cross-Drum Boilers.—To eliminate the objectionable 'geysering,' especially on shipboard where boilers are usually forced to maximum capacity, the cross-drum boiler was developed by several firms. The Alert type as developed by Babcock & Wilcox for marine service is shown in Fig. 8. The longitudinal drum of Fig. 6 is here replaced by a cross-drum, usually 42 to 48 inches in diameter. The sinuous headers are retained, and each set is connected to the drum by tubes as shown. As the headers connections enter along the entire length of the lower side of the drum, the disengaging surface is great.

Vertical Water-tube Boilers.—When the tubes have a slope of over 45 degrees, it is usual to class them as being of the vertical type. There are then included in the vertical horizontal-drum class two distinct types, one a boiler made up of an upper and a lower drum placed with the cylinder axis horizontally connected together by straight tubes. This type includes the Erie City vertical (Fig. 9), the Milne and the Ladd designs. As long as this type was used for medium capacities, the number of tubes possible to place in the drum shell was sufficient. But when capacities went over 24,000 lbs. per hour, it was necessary to employ three or more drums, which in turn forced the employment of tubes with ends bent to enter the drum radially.

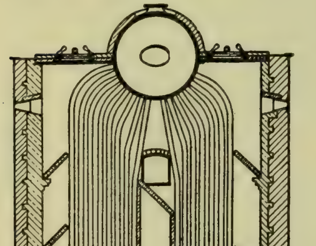


FIG. 9.—*Erie City Vertical Boiler*

Inclined Tube Horizontal-drums Water-tube Boiler.—The Stirling boiler was the first of this design to be manufactured but during recent years many modifications have been introduced by various boiler manufacturers.

In the Stirling boiler (Fig. 10) the heating surface is almost wholly supplied by water tubes. The main tubes connect three steam drums above with the water drum below. The sides and back and front of the boiler are composed of brickwork, in which suitable doors are provided for cleaning, etc. In addition to the main tubes there are short curved tubes, which connect the three steam drums with one another. Above the middle steam drum is a dome with an anti-priming pipe, through which the steam is taken from the boiler. There are no brickwork supports under the lower drum, which hangs from the upper drums by the tubes, so that the whole boiler is free to expand without disturbing the brickwork. The feed-water is introduced below the water level in the backmost top drum; it then finds its way down the bank of tubes to the lower water drum. The water then passes, by means of the inclined tubes, to the upper drums. By means of suitable baffles, the furnace gases are compelled to pass up and down the various banks of tubes until they reach the flue. On account of the very large combustion chamber, the walls of which are made of fire-brick, and are maintained at a very high temperature, the combustion of the fuel is exceptionally good.

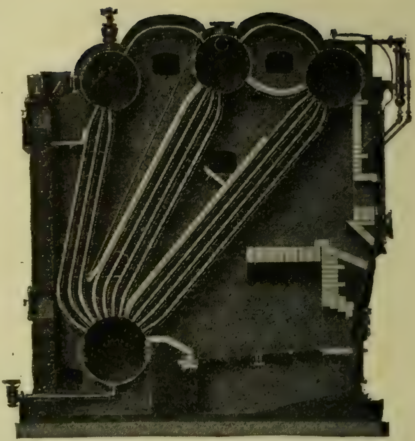


FIG. 10.—*Stirling Boiler*

The tubes are curved at their ends in order that they may enter the drums in a radial direction. This makes it a simple matter to expand the ends of the tubes tightly into the holes in the drums; whereas, if the tubes were straight and entered the drum shells at a sharp angle, it would be difficult to make water-tight joints. Manholes are provided in the ends of the drums, so that workmen may enter the drums to clean them internally.

The original Stirling boiler had three upper and one lower drum. Modern tendencies are toward two upper and one lower drum for all but the largest boilers. When capacities go to over 100,000 lbs. of steam per hour, some designers use two upper and one lower drum for the boiler but add a second section of an upper and a lower drum, with connecting tubes as an integral economizer. This extra heating surface permits a reduction in the flue-gas temperatures.

High Steam Pressure Boilers.—There are two methods by which the efficiency of a power plant can be increased to any extent, either through an increase in boiler pressure or in the temperature of the steam. For metallurgical reasons a temperature of much over 750° F. is impractical, so there has been a steady increase in the boiler pressure. Also an increase in pressure reduces the amount of boiler heating surface per kilowatt of turbine output. This is due to the reduced steam consumption of the turbine with an increase in pressure. For example, with steam of 200 lbs. pressure each kilowatt capacity of the turbine would require about 1.75 sq. ft. of boiler heating surface; for 400 lbs. about 1.37 sq. ft. is needed and for 1,200 lbs., only 0.34 sq. ft. is needed. This offsets the natural increase in cost of high-pressure boilers per square foot of heating surface.

High-pressure plants, to generate cheap and dependable power, cannot be designed simply as replicas of low-pressure plants, with boilers, turbines and auxiliaries modified for safe and efficient operation under new and radically changed conditions. While the experience gained with low-pressure equipment should, of course, be utilized as far as possible at every step, the design must be worked out from the ground up. Only in this way can full advantage be taken of the fuel-saving possibilities of higher pressures without sacrificing reliability or incurring undue fixed charges.

At one time (1926–1929) it seemed that the next logical increase in pressure above 450 lbs. should be 600 lbs. However the first 600-lb. plants installed revealed that this was not correct, for the additional cost of the boilers was too high for the increase in efficiency. This difficulty was due to the problem of reheating the steam. If the boiler pressure is 450 lbs., the steam is not unduly wet until it reaches the exhaust end of the turbine; on the other hand with 600 lbs. steam, expansion to, say, 350 lbs., causes the steam to be so wet as to erode the blades in the lower end of the turbine unless the steam is reheated back to about 700° F. This reheating is accomplished by taking the steam from the turbine at about 300 lbs. pressure and passing it through a boiler or nest of tubes in a boiler setting, where the steam is reheated to 700° and is again returned to the turbine, to be expanded in the lower stages of the turbine. The thermal gain is more than offset by the cost of the reheating boiler and pipe lines. But with 1,200 lbs. boiler pressure, the thermal gain justifies reheating. Consequently modern boiler designs jump from 450 lbs. to 1,200 lbs. pressure.

There is little difference in design between a 400- and a 1,200-lb. boiler. The high-pressure boiler designers have here followed the designs at lower pressures, and where the drums were too thick for plate and rivet construction, they have been made of forgings. The machinery used during the war for making cannons has been put to good use manufacturing boiler drums, oil stills and high-pressure vessels for other purposes.

Both the vertical and the horizontal types of boilers have been used. In general it may be said that the horizontal type is somewhat cheaper on account of the cost of forged drums, but there may be cases where the space limitations in old buildings are such as to make the vertical or semi-vertical type the best choice. The arrangement of superheater, reheater and type of firing will often affect the type of boiler to be chosen. This same selection of boilers is often used abroad; although the lower cost of forged drums in Europe has caused favoring the semi-vertical boiler, and the largest installations there are of this construction.

The construction of the drums has been a most difficult one. For 1,200-lbs. pressure a 42-inch diameter drum must be about 8 inches thick. It is of course impossible to roll and rivet plates for such a drum, so forged drums are employed exclusively. These are generally a solid billet, pierced and hollow forged. The ends are then drawn down by forging. No single method of calculation of the necessary wall thickness is acceptable to all designers.

For ordinary rolled and pressed drums the inner radius of the vessel multiplied by the pressure and divided by the allowed stress of the material used determines the thickness of the shell when increased by the seam efficiency of the tube-ligament efficiency, whichever gives the thicker shell. This applies to shells up to 2 or 2⅜ inches thick for the usual diameters used for boiler drums. The limit in pressure for this class of work is 600 lbs. to 700 lbs. pressure.

For thicker drums the problem becomes more complicated. Lame for hydraulic work adopts the formula:

$$S = P\frac{r^2_1 + r^2_2}{r^2_1 - r^2_2}$$

The A. S. M. E. code has endeavored to take care of thick cylinders by saying that 'if the thickness exceeds 10 per cent. of the radius, the outside radius must be taken in figuring the thickness' in the following formula:

$$S = \frac{r^1 \times P}{t}$$

A comparison of three proposed formulas is shown in the following table calculated for drums of 50 inches outside diameter, pressure as shown and plates 3 and 4 inches thick.

Pressure	Stress, t = 3 in.			Stress, t = 4 in.		
	Clark	Lame	A.S.M.E.	Clark	Lame	A.S.M.E.
800	6,750	6,320	6,666	4,840	4,624	5,000
1,200	10,150	9,790	10,000	7,220	6,936	7,500
1,600	13,500	12,640	13,333	9,650	9,248	10,000
2,000	17,000	15,800	16,666	12,150	11,560	12,500

At the present time this disparity does not make a great deal of difference in the usual run of cases except where a little more thickness requires the next size ingot or throws the ingot into larger furnaces and lathes.

When it comes to establishing the safe stress to use, there is a much wider discrepancy. The A. S. M. E. code provides for a factor of safety of five based on the tensile strength. Nothing is said about the temperature at which the tensile strength is to be measured,, and at the lower pressures this makes no difference. There seems to be a tendency on the part of other engineers to reduce the factor of safety on the thicker drums but others feel that this is a wrong move until more information is available on creep and other undetermined stresses.

A few tests are available on creep stresses of some steels. These tests number in the hundreds, while they must be in the thousands before definite figures are available. Tests are now made in laboratories on small samples that may represent minimum, average or maximum conditions, and, furthermore, stresses are encountered in actual boiler operation that cannot be duplicated in laboratory work, although these tests give the trend of what may be expected.

The tubes do not offer any serious problems and while tubes with ½ inch walls are employed, there is reason to feel that thinner tubes will be used in the future. Thick tubes must experience stress due to differences in expansion between the inner and outer wall, which would be avoided by thinner walls.

Boiler Plate Failure.—With the advent of high pressures and high rates of evaporation, there have been many cases of plate fracture in boilers, especially along the riveted point. Investigation has revealed that such trouble as has been experienced has occurred in boilers that used a zeolite feed water treatment; this is a caustic treatment, and it is claimed by many that the caustic soda has caused embrittlement. But this theory does not give a plausible explanation for all plate failures, for in some cases there has been no caustic condition of the feed water.

The metal fails due to progressive cracking, but the structure of the metal adjacent to the crack does not become any more brittle than it was before. The condition of the water or other corroding media in contact with the metal while under stress, however, does have a material effect upon the acceleration of the cracking. To this extent the idea of maintaining a non-destructive condition of boiler water has a sound basis. However, this is not embrittlement, but probably an action on the part of certain ingredients in the water that destroys the protective film which otherwise would form on the bare surfaces of the pit or crack that is the initial starting point of the failure. To what extent various waters accelerate corrosion fatigue, pitting and cracking under boiler conditions has not been adequately investigated.

Any condition which produces unrelieved or locked-up stress in the boiler plate is a potential cause for eventual failure. These initial internal stresses are often not well understood, but suitable annealing will often avoid such failures. Some mysterious failures have their origin in locked-up or unrelieved stresses. Usually, however, a thorough examination of a fatigue crack will disclose that the part was subjected to repeated excess stress of sufficient frequency and magnitude to account for the failure during its period of service.

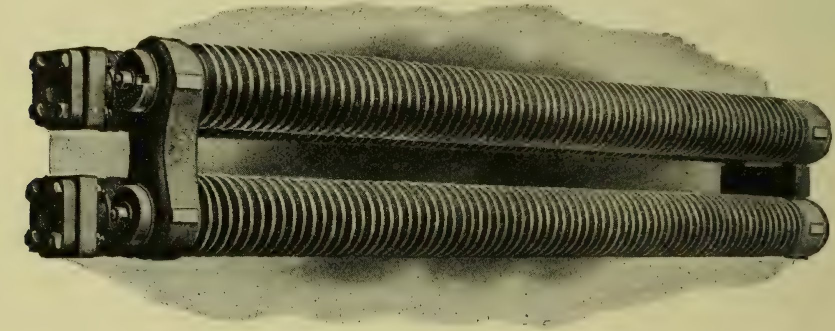


FIG. 11.—*Two Tubes of Foster Superheater*

It has been found by experiments in corrosion fatigue carried on at the Engineering Experiment Station, Annapolis, Md., under the direction of Dr. D. J. McAdam, Jr., that failure will be initiated under conditions of cyclic stress when the metal is exposed to a corroding medium at stress much below the elastic limit and well below the ordinary endurance limit.

There are numerous boilers in service where certain parts, due to the design, construction and operating condition, are subject to repeated loads which produce a localized fiber stress considerably in excess of 10,000 lbs. per square inch. Such boilers are likely to fail some time without regard to condition of feed water. If feed water is unfavorable, such as sea water or water high in certain salts, the fatigue failure will be accelerated. Hence while proper conditioning of feed water does have a considerable effect in retarding failure, bad water, of itself, is not the fundamental cause of fatigue cracks.

Superheated Steam. — Water when boiled produces saturated steam, which has a definite temperature for each pressure. If steam is still further heated in the absence of water, its temperature may be raised above that of saturated steam for the same pressure, and it is then called superheated steam.

The advantages of superheated steam for use in steam engines or turbines arise from the facts that it carries no moisture in suspension, has a greater heat content for the same weight, permits the attainment of higher steam temperatures, and therefore higher engine efficiency without a correspondingly higher steam pressure, and if sufficiently superheated does not condense while doing work by expansion, as does ordinary steam. Its effect in improving steam economy has been most marked in the case of the steam turbine, the steam consumption of which is reduced about one pound per horsepower hour for each 60° F. superheat.

The Foster superheater, illustrated in Fig. 11, consists of a series of straight, seamless steel tubes expanded into headers at the ends and having strung close together upon them rings of cast iron which serve the dual purpose of reinforcing the steel tubes and of presenting a larger surface for the abstraction of heat from the hot gases. Such a superheater may be placed in various positions in the furnaces of nearly all kinds of boilers, or it may be heated by an independent furnace of its own. It is more usual, however, to heat it by gases which have been partly cooled by contact with boiler surfaces. A superheater may also be used for heating air or other gases.

The form of superheater used in connection with the Babcock & Wilcox boiler is shown in Fig. 12. It consists of a series of U-shaped tubes, the ends of which are expanded into two headers or manifolds, the whole being located between the steam drums and the upper rows of tubes, where it is in contact with the hot gases between the first and second passes. The steam enters one of the headers from the steam drums, flows through the tubes of the superheater into the other header, and thence to the outlet from the boiler. The tubes are held only at their ends and are therefore free to expand and contract under variation of temperature. The headers are provided with handholes, covered by suitable fittings, through which access may be had to the ends of the superheated tubes.

Mechanical Stokers are used mainly for three reasons: first, to reduce the cost of boiler-room attendance by reducing the number of men required; second, to insure a more uniform and economical firing; and, third, to secure more perfect combustion and decrease the amount of smoke. The first end is especially important in large boiler plants.

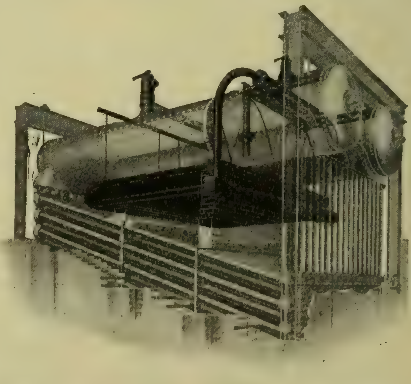


FIG. 12.—*Babcock and Wilcox Superheater*

but in small plants which could be tended by one man there is little or no saving. The stokers on the market may be divided into three classes: under-feed stokers in which the fuel is forced continually up into the fire bed from beneath; over-feed stokers in which the fuel is pushed onto the upper end of an inclined grate, the bars of which may or may not have a rocking motion; and a third class known as chain-grate stokers.

The Riley stoker, illustrated in Fig. 13, is of the under-feed type. A reciprocating plunger, driven by a small steam engine or a motor, receives coal from a hopper at the front of the boiler and forces it into the furnace and under the fuel bed, where it is gradually forced upward into the zone of combustion and spreads out sidewise over the edges of the sloping retorts. These retorts form the supports for the fuel bed and are provided with air openings or tuyères, through which air is admitted to the furnace through the fuel bed. The green coal is forced in at the front of the furnace, and gradually works down the inclined retorts to the back of the furnace, where the ashes are dropped into the ash pit over a dump plate. The movement of the burning fuel is aided by the reciprocating motion transmitted to the sides of the retorts. As the freshly fed coal becomes heated, the volatile matter it contains is driven off and forced to rise through the incandescent fuel bed above, where it is either consumed by contact with oxygen or at least broken down into simpler gases which will not give rise to smoke. This form of furnace is thus especially suitable for burning bituminous or soft coal. In stokers of this general type it is customary to enclose the ash pit and force in a blast of air by means of a blower.

Stokers of the under-feed type are sometimes referred to as coking stokers, since the coal is first coked by the driving off of the volatile constituents. The burning of anthracite or hard coal requires no such action as this and is therefore suitable for burning on stokers of the end-feed or chain-grate types.

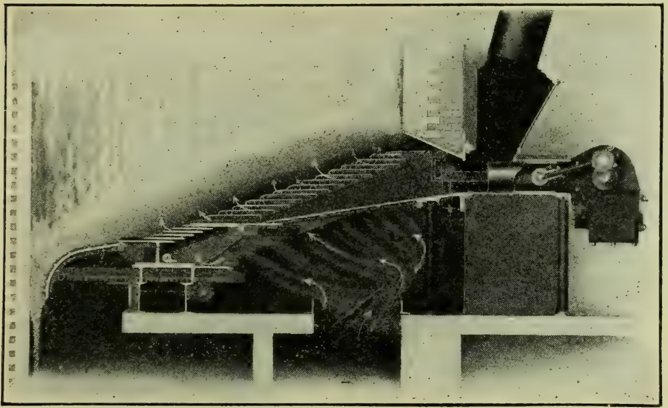


Fig. 13.—*Riley Underfeed Stoker*

The end-feed type of stoker is known as the Roney, consists of a series of bars placed crosswise of the furnace and forming a stepped inclined grate. The bars are pivoted and are connected to a driving mechanism at the front of the boiler, by which they are given a slight rocking motion. The coal is fed on to the upper end of the grate from the hopper along the boiler front, and the rocking of the bars carries it down to the rear, where the ashes are dumped into the ash pit.

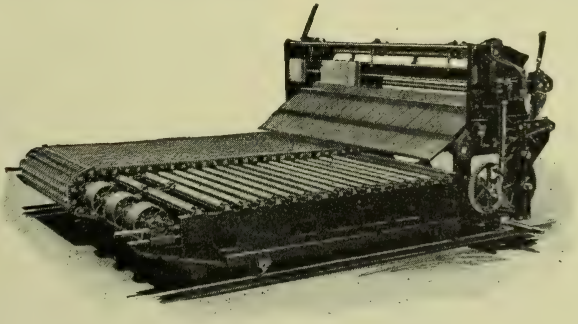


Fig. 14.—*Green Chain-Gate Stoker*

The Green chain-grate stoker is shown in Fig. 14, half of the grate being removed from one side to indicate the method of support. The grate itself is made up of a series of short links joined together to form an endless belt or chain, which passes over drums at the front and at the rear and is prevented from sagging along the upper side by a series of rollers carried by the frame. The endless chain is given a continuous motion by suitable driving mechanism at the front of the boiler and the flat top of the chain travels slowly from the front of the furnace to the rear. The fuel is fed on to the grate at the front end, from a coking plate just inside the coal hopper. On this plate the coal is subjected to the reflected heat from the arch over the furnace and all volatile matter is rapidly distilled from it. It then drops on the grate, the speed of which is so timed that the coal is completely burned when it reaches the rear end of the grate, where it falls into the ash pit. The entire mechanism of this stoker is carried by a heavy frame mounted on rollers, so that it may be withdrawn from the furnace when repairs become necessary.

Stokers for Small Boilers.—Stokers by reason of their high cost are seldom used on small boilers. Of late, however, several stokers of low first cost have been designed for application to small boilers, especially of the heating type. While one or two chain-grate stokers are available the usual small-boiler stoker is of the underfeed type. One of these, built by Leffel & Co., is shown in Fig. 15. The new unit is made in sizes suitable for boilers ranging from 150 to 2,000 sq. ft. of heating surface, and can be readily applied to existing as well as to new installations.

Referring to the illustration, it will be seen that the various parts of the stoker are combined to form a complete assembly, which is placed in front of, and made to rest on, the same level as the boiler itself. The forced-draft fan is directly connected to the driving motor, with the re-

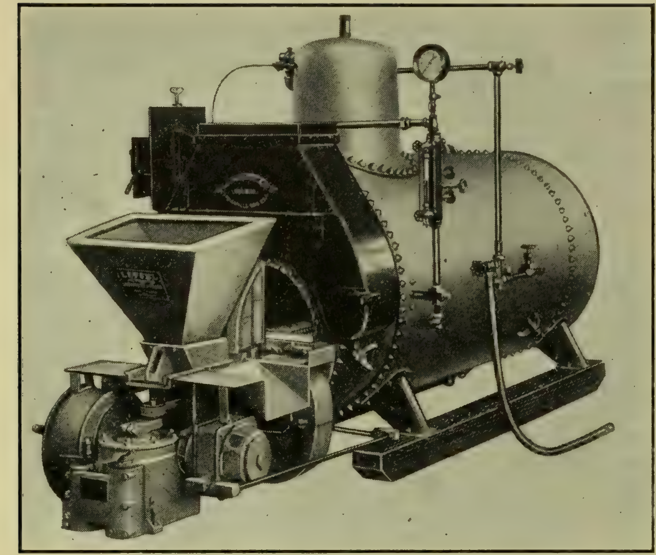


FIG. 15.—*Leffel Stoker for Small Boilers*

duction gear for the stoker ram drive in the centre. The crank driving the ram revolves in a horizontal plane instead of the usual vertical plane. By this design the gear reduction has been simplified and the space required between the motor and fan has been reduced. Manual control of the forced draft air is by a damper on the air intake of the fan. Automatic control of the complete unit is effected by a pressure-switch mounted beside the combined starter and safety switch on the boiler smokebox.

Pulverized-Coal Burning.—The idea of finely crushed coal so that upon introduction into the furnace it would burn as freely as natural gas, was proposed a hundred years ago. But the commercial application began as late as 1910. Since then the development of coal grinding and handling apparatus has been exclusive, and at present about one half of the power boilers installed each year is equipped for the burning of pulverized coal.

Two basic methods are used: The central pulverizing and the individual pulverizing systems. Until recently it was the practice to place the coal pulverizers in a building separate from the boiler house. The coal was ground and conveyed to a storage bin and was drawn and conveyed to each boiler. With this system the coal had to be thoroughly dried before storage to prevent clogging of conveyor screens; this was accomplished by separately fired rotary drums or by the boiler fuel gases. This system was expensive and entailed considerable extra labor.

At present the tendency is toward the use of individual grinders and blowers, as many as six being used on one boiler. The pulverizer is some type of paddle wheel revolving at high speed, and by impact the coal is finely pulverized (Fig. 16). A blower mounted on the same shaft as the paddle wheel blows the coal dust and part of the air supply through the burner nozzle. The remainder of the air is taken in through openings around the burner. If the coal is bituminous with the usual amount of moisture no drying is necessary. But lignite which may contain 40 per cent. of moisture usually necessitates some drying.

The location of the burners in the furnace influences its combustion efficiencies. One modern arrangement has four burners placed at the corners of a square furnace, with the coal stream issuing in a longitudinal direction. Some designs have the coal entering the furnace from the furnace roof, while in others the burner is placed in the furnace front.

Furnace Construction.—Modern high rates of combustion prevent the use of the plain fire brick which was customary ten years ago. Instead some protective wall must be used. The Bailey water wall consists of a series of water tubes in connection with the boiler drum; these

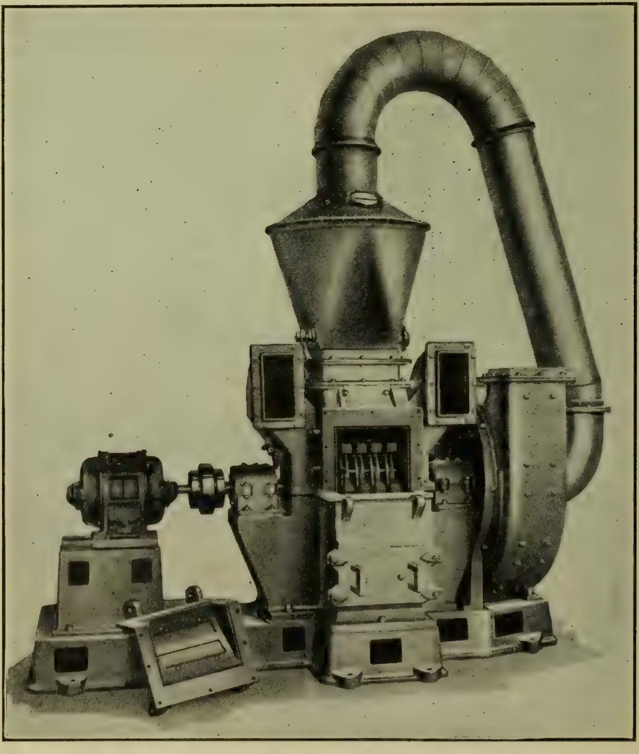


FIG. 16.—*Coal Pulverizer with Blower Incorporated*

tubes form a complete screen around the furnace and also on the bottom in case of pulverized coal burning.

To prevent damage to the tubes, the sides toward the furnace heat are covered with a series of cast-iron plates which are faced with carborundum. A boiler with this type of furnace is shown in Fig. 17.

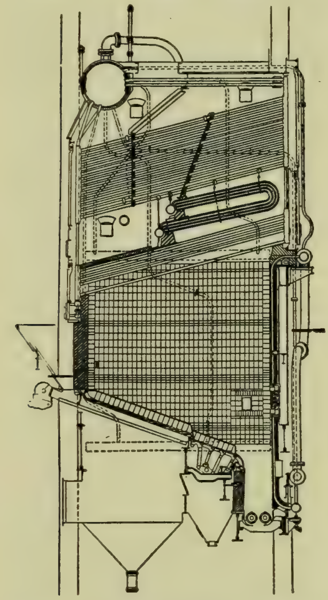


FIG. 17.—*Cross Section of Boiler showing Water Walls and Underfeed Stoker*

The Murray fin-type boiler wall has each water tube in the furnace wall provided with two longitudinal fins. The tubes are placed far enough apart that the fires of the adjustment tubes touch and so give a complete metal jacket between the furnace and the outer brickwork. These water walls have permitted high furnace temperatures and give high combustion efficiencies. As a result of these developments boilers have been built to deliver over one million pounds of steam per hour.

Natural or *chimney draft* is caused by the difference in weight between the products of combustion in the chimney and an equal volume of cooler air outside; on this account it is necessary that the waste gases should leave the boiler at a comparatively high temperature (about 600° F.), the height and diameter of the stack having a decided influence on the temperature needed.

Forced Draft.—With forced draft the air is not drawn through the furnace as with natural draft, but is made to enter under a small pressure. It is therefore possible to use more heating surface for a given grate area, and the products of combustion can be discharged at a lower temperature, thus increasing the efficiency of the boiler. With a properly arranged system of forced draft, an increase in capacity, as compared with natural draft, will result. In land practice it is usual to add to the heating surface by introducing an economizer, which acts as a feed-water heater by utilizing some of the otherwise wasted heat in the flue gases.

Induced Draft.—In modern boiler plants it is usual, where air preheaters are used, to draw the gases from the boiler and discharge them through the air heater. At the same time air is forced through this heater and its temperature raised to about 400° F., the air then passes into the closed ash pit of stokers or into the furnace of a pulverized coal furnace. In this way some of the heat usually lost in the stack gases is recovered.

Air Preheaters.—Modern boiler plants are almost all equipped with air preheaters, consisting of sets of tubes or plate partitions through which the flue gases from the boiler, under the influence of an induced draft fan, pass on their way to the chimney. On the outside of these tubes or compartments air for the furnace is drawn by a fan and forced through ducts to the stoker or pulverized-coal furnace.

This arrangement increases the boiler efficiency by decreasing the temperature of the gases entering the stack. The situation might be pictured as one where a certain amount of heat leaves the boiler in the gases of combustion. Part of this heat is short circuited through the air preheater and returned to the furnace. A furnace air of about 400° is as high as safety allows on account of damage to stoker parts or to the furnace. In many instances when the air preheater is installed, the feed water economizer is left out of the design; in others both are employed, though seldom is this justified.

Feed-water Heaters.—One of the most important means for the increase of boiler-plant efficiency consists in heating the feed-water as much as possible before its entry into the boiler. This is best done by utilizing some of the heat of the products of combustion which would otherwise escape up the chimney. One of the best known forms of apparatus for this purpose is Green's economizer (Fig. 18), which consists of a number of vertical cast-iron pipes about 4 inches in diameter and 9 feet long, connected at the top and bottom by longitudinal headers, termed boxes. These boxes are connected by top and bottom branch pipes, placed lengthways on opposite sides of the economizer, and on the outside of the brickwork with which it is encased. The feed-water is pumped into the economizer at the lower branch pipe nearest the point of exit of the flue gases, and emerges from the upper branch pipe nearest the point where the flue gases enter. In an economizer the temperature of the water may be brought up nearly

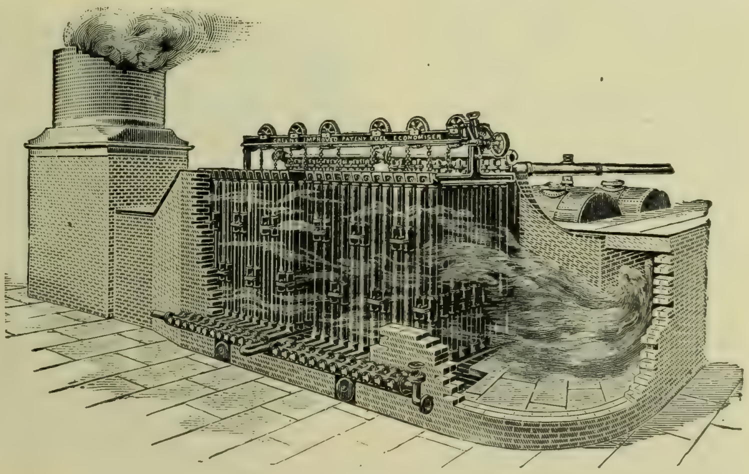

GREENS IMPROVED PATENT FUEL ECONOMISER

FIG. 18.—*Green's Economizer*

to the temperature of evaporation, leaving only the work of evaporation to be done by the boiler. Economizer surface is more efficient in transmitting heat than an equal amount of boiler surface on account of the lower temperature of the contained water, and it costs considerably less.

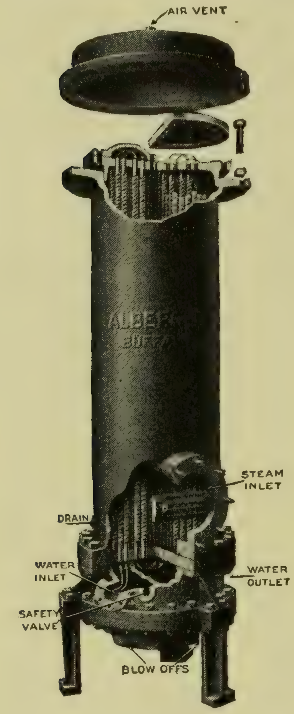


Fig. 19.—*Alberger Vertical Feed-Water Heater*

Very often the feed water supplied to the economizer is first sent through an exhaust-steam heater, where its temperature is raised to from 120° to 200° F. After leaving the economizer, the water has a temperature of from 200° to 300° F. The gases that leave the economizer are cooled to a temperature of 350° or less, which is too low to produce sufficient natural draught. It is therefore customary to install some form of mechanical draught apparatus in connection with an economizer.

There are many forms of feed-water heaters in which the feed-water is heated by means of the exhaust steam from engines or pumps. The Alberger feed-water heater (Fig. 19), which may be taken as an example, consists of a large number of helically corrugated copper tubes through which the feed-water flows. Partitions in the heads are so arranged that the water is compelled to flow twice in each direction the full length of the heater. The corrugations cause rapid mixing of the water and increase the rate of heat transfer. The exhaust steam enters the shell at the bottom and surrounds the tubes. Suitable drains and blow-offs are provided at the bottom to remove the condensed steam and any sediment deposited by the water when it has been heated. This type of heater, in which the water and steam do not come in contact, is called a closed heater. Many closed heaters consist of U-shaped or spiral coils of pipe enclosed in cylindrical shells and surrounded by exhaust steam.

The Hoppes feed-water heater (Fig. 20) is of the open type; that is, the exhaust steam is mingled directly with the feed water. To promote the rapid mixture of the steam and water the latter is caused to flow in succession over a series of trays which are removable and serve also as receptacles for the lime and magnesia precipitated from the water by the heat. The water then falls into a settling chamber, from which it is drawn off and pumped to the boiler. The exhaust steam enters through an opening in the front head and strikes the baffle plate of an oil separator, which removes the oil carried along with the exhaust steam. It is important that such a heater be provided with some efficient means of removing the engine cylinder oil present in the exhaust steam, because, if the oil were pumped into the boiler with the feed water, it would collect on the plates and tubes and might lead to overheating, resulting in the formation of bags and blisters.

High-pressure steam generating units, to obtain an approximate regenerating cycle, almost universally employ from three to five stages of feed-water heating. This is obtained by tapping the turbine at three or more points to draw off steam at different pressures, which supplies are used to raise the temperature of the feed water in successive steps. The high-pressure bleed points are such that the heaters taking steam from these points are located on the pressure side of the boiler-feed pump. Therefore, in stage heaters in the feed cycle of modern high-pressure units, it is not unusual to have pressures from 900 to 1,600 pounds in the hydraulic circuit, and pressures from 125 to 300 pounds in the steam space.

With the advent of these higher pressures it became necessary to discard the conventional heater employing cast iron for both water boxes and shells. Cast-steel water boxes and covers and steel shells were first employed for moderately high pressures, a departure from the conventional design early indicating the necessity for materials other than cast iron. Cast iron is inherently porous and the porosity is often not detected until after the castings have been subjected to the severe pressure and temperature conditions encountered in stage heating service, and is not reliable. The latest heater designs are made entirely of plate steel, with an arrangement to expel the air entering with the steam.

Feed-Water Treatment.—Formerly no attempt other than settling of the mud was made to supply boilers with clean non-scaling water. Consequently as soon as the water became heated it threw down its carborates

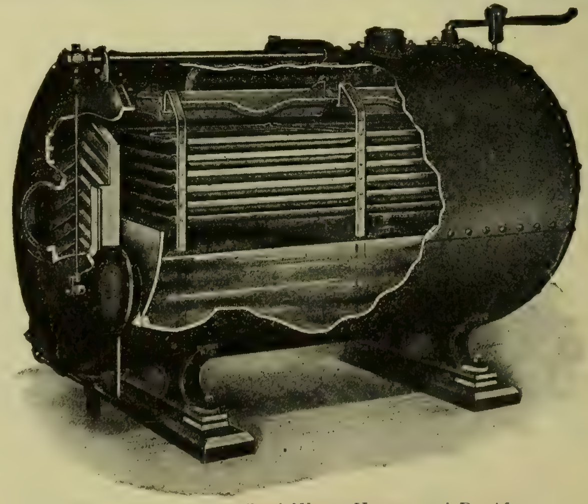


Fig. 20.—*Hoppes Feed-Water Heater and Purifier*

which speedily formed a hard scale in the tubes. Weekly descaling operations were necessary if any degree of boiler efficiency was to be obtained. With the event of high pressures and high rates of evaporating even a thin coat of scale which is a poor heat conductor might cause a burned tube. This condition led to various methods of heating the water to either remove the scale forming material or change its chemical constitution to a point where the mineral matter would remain in suspension and not settle out. Standard water - softening methods introduce six individual sodium salts. Internal treatment with chemicals or boiler compounds introduces additional sodium salts.

The continuous - blow - down method for the removal of a portion of the boiler water to minimize the soluble concentration is faulty in that the individual properties of each sodium salt are overlooked and the soluble concentration is considered as a unit mass.

Sodium sulphate and sodium chloride, contributing to mass concentration, differ from sodium nitrate, which introduces corrosion, and the carbonate, bicarbonate and hydroxide of sodium, which introduce causticity. Except under the most favorable conditions wherein the sulphate of sodium predominates, chemical control is necessary to establish a minimum causticity and to maintain the correct sulphate-alkalinity ratio for the prevention of embrittlement. Soluble concentration, therefore, introduces factors that of necessity require chemical control in contrast to the insoluble concentration which is removable.

The presence of sodium bicarbonate or sodium carbonate in feed-water results in a high concentration of caustic alkalinity in the boiler. Water-softening procedure usually introduces into the feed-water one of these sodium salts, which, under the high temperature in a boiler breaks down to caustic soda. Investigation has disclosed that the presence of uncontrolled caustic in the boiler water leads to embrittlement, or at least plate fractures are more prevalent when the feed is highly caustic. Further, it has been determined that to minimize the effect of caustic in the boiler, a definite ratio between the sulphate content and the alkalinity must be maintained. A safe sulphate ratio has been established for each working pressure, and with increasing pressures proportionately higher sulphate ratios are required. The use of other salts, such as tannates and phosphates, for the prevention of embrittlement is still in the experimental stage. It is for this reason that the sulphate-alkalinity ratio has been accepted in boiler-water conditioning as the only safe index in the prevention of embrittlement.

It is evident that in allowing a high alkalinity to develop in a boiler, a greater concentration of sodium sulphate will be required. A critical condition is reached with high alkalinity wherein the proper ratio establishes an excessive soluble concentration: or, in the absence of the proper ratio, protection is not provided against embrittlement.

For the proper control of concentrations the initial procedure is to provide the correct means for conditioning the feed-water. Water-softening methods designed to convert scale-forming salts to soluble salts introduce the component elements responsible for high caustic alkalinity. Correct conditioning minimizes the alkalinity, and, in so doing, reduces the soluble concentrations in the boiler, thus facilitating the prevention of embrittlement.

Available means for the control of concentrations in boiler water include deconcentrating equipment and the continuous blowdown system with heat exchanger. Deconcentration involves the definite chemical control of reactions within the boiler to produce the maximum quantity of suspended solids or sludge, and the continuous circulation of a portion of the boiler water to a settling tank where the suspended solids deposit and from which the clarified water returns to the boiler.

Continuous blowdown, with the transfer of heat units to incoming feed-water by means of a heat exchanger, is a dilution method. The dilution process involves the removal of a portion of the boiler water and its replacement with fresh water, whereas deconcentration provides for the separation and removal of impurities without the waste of the purified water.

Boiler Fittings.—Every boiler should be provided with one or more safety valves. A safety valve should not permit the pressure of the steam in the boiler to rise above a fixed limit; and when the blowing-off pressure is reached, it should discharge steam so rapidly that little or no increase in the pressure of the steam can take place, however rapidly the steam may be generated. The standard form of safety valve is the spring-loaded safety valve. The lever safety valve is rapidly becoming obsolete.

A reliable gauge to indicate the steam pressure is also a necessary adjunct to a boiler; it should be removed from the boiler at regular intervals and tested, for gauges are liable to get out of order when in constant use, and to give inaccurate indications of pressure. A boiler should have a water gauge to show the height of the water at all times. It is also customary to provide gauge cocks, which are more dependable, although not so convenient as gauge glasses. The bottom portion of the gauge should be fixed so that when the water is in sight in the glass there should be sufficient water above the furnace crown, generally from 4 to 6 inches.

Small boilers are often fed by injectors, but larger boilers usually receive their water supply from centrifugal or direct-acting feed pumps.

Boiler Rating.—In the past the capacity of a boiler as a steam generator was commonly expressed in *boiler horsepower, i.e.*, the evaporation of 34.5 pounds of water per hour from a temperature of 212° F. into steam at the same temperature; or, as it was usually stated, it is the evaporation of 34.5 pounds of water per hour from and at 212° F. As the evaporation of 1 pound of water from and at 212° F. requires 970.4 British thermal units, a boiler horse-power was equivalent to 33,497 B.t.u. per hour.

The amount of water that can be evaporated per hour in a boiler depends on the rate at which it is possible to produce hot gases and pass them over the heating surfaces; that is, it depends on the rate at which fuel can be burned in the furnace. Consequently the method outlined is of no value and has been replaced by the system of stating the square feet of heating surface the boiler possesses, and the total amount of steam the boiler will generate at a stated efficiency. At present the technical press and technical societies do not speak of boiler horse-power but describe a boiler as having so many *square feet of heating surface* and as having a normal output of so many pounds of steam at the given boiler pressure.

Boiler Efficiency.—A well arranged boiler will utilize from 70 to 80 per cent. of the available heat in the fuel; with careful operation the efficiency may be raised to 85 per cent. In case oil is used for fuel, the mixture of oil and air can be made very thorough, and a smaller amount of excess air may be used. With careful firing, as little as 10 per cent. of excess air may be admitted and an efficiency of more than 80 per cent. may be realized in consequence. Oil fuel for steam boilers is used extensively on the Pacific Coast, in New England, and in marine practice. Natural gas has also become a boiler fuel in the West.

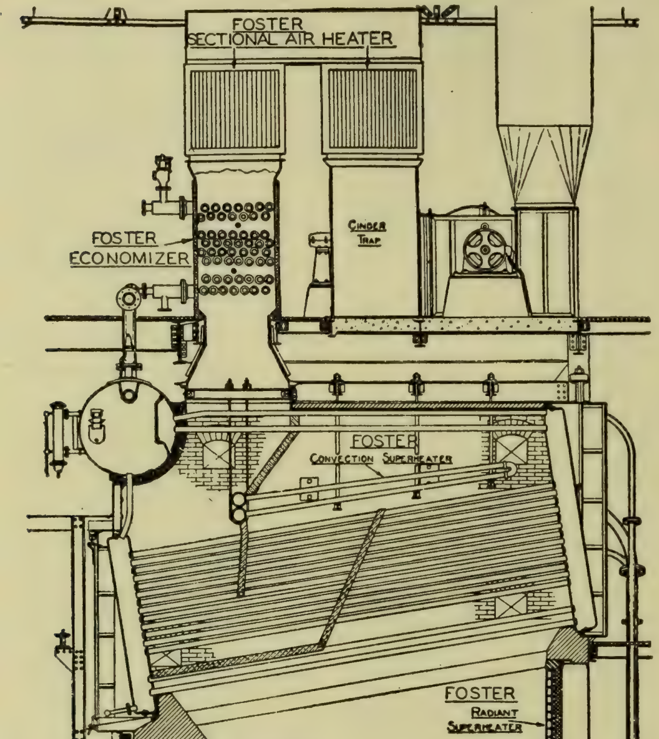


FIG. 21.—*Cross Section of Modern Boiler showing Air Preheater, Economizer, Draft Fans, Stoker and Superheater*

The rate at which heat is conducted through the walls of a boiler depends mainly upon the difference in temperature between the hot furnace gases and the water. The iron or steel of which a boiler is usually made is a good conductor, but the presence of even a very thin layer of scale on the boiler plates greatly impedes the passage of heat through them; in fact, scale on the plates has a far greater effect in hindering the conduction of heat, and thus reducing the evaporative power of a boiler, than the thickness of the plates themselves.

The chief sources of waste in a boiler are: unsuitable proportions of furnace combustion chamber, fire grate, and heating surface; deficiency or excess of air supply; incomplete combustion; radiation; priming; leaky joints, valves, cocks, etc.; scale and soot on heating surface; flue-gas waste; and leakage of air into flues through defective brickwork. All radiating surfaces in boiler and steam-pipes should be properly covered with some efficient non-conducting covering.

Boiler Laws.—In the United States, the most comprehensive set of rules covering the construction of steam boilers is the *A. S. M. E. Boiler Code.* This code comprises specifications for the materials to be used in boiler construction and rules for the sizes and proportions of parts, allowable pressures, methods of testing, and location of accessories. In many cases, the specifications for materials are those of the American Society for Testing Materials. The *A. S. M. E. Boiler Code* is the work of a committee appointed by the American Society of Mechanical Engineers to formulate a set of standard specifications for the construction of pressure vessels. The committee called into consultation an advisory committee made up of a large number of engineers intimately identified with the design and manufacture of steam boilers, and each section of the code was adopted only after it had received unanimous approval. It has been adopted as the legal rule governing boiler construction and inspection in a large number of States.

Bibliography. — Consult W. Kent's *Steam Boiler Economy;* C. E. Stromeyer's *Marine Boiler Management and Construction;* Haven and Swett's *Design of Steam Boilers* (1915); Gebhardt's *Steam Power Plant Engineering* (1918); Crofts' *Steam Boilers* (1925).

Boiler Compositions, or COMPOUNDS. The most objectionable impurities in water to be used for steam raising are the bicarbonates of calcium and magnesium, magnesium chloride, calcium sulphate, and, in sea water, common salt. When water containing the bicarbonates is boiled, carbon dioxide is evolved, and calcium and magnesium carbonates are precipitated. Calcium sulphate is probably the worst impurity. It is soluble in water at nearly all temperatures, and, even if present in but small quantities, is deposited, either alone or with the carbonates, as a very hard, coherent scale. Magnesium chloride is decomposed on boiling, with deposition of magnesium hydroxide and liberation of free hydrochloric acid. If carbonates are present, the acid will combine with them, but forms chlorides; if not, it will corrode the steam pipes and the boiler plates above the water line.

In low-pressure boilers on board ship salt water is sometimes used, but as it becomes concentrated the salt is deposited. The degree of saturation is tested by the specific gravity. With high-pressure and tubular boilers salt water cannot be used, and a distilling apparatus or evaporator is necessary. Peaty waters contain organic acids which destroy the boiler plates, usually at the water line. The addition of a small quantity of chalk, or the mixture with a proportion of hard water, obviates this difficulty.

Preventives.—The bicarbonates are readily removed by heating the feed water, whereby they are deposited in the heater; or the water may be softened by the addition of lime. Caustic soda is often introduced into boilers; it combines with the carbonic acid of the bicarbonates, giving sodium carbonate, and precipitates the calcium and magnesium carbonates. The sodium carbonate then reacts on the calcium sulphate, forming sulphate of soda and carbonate of lime. If carbonates are not present in the water, washing soda may be used. These substances are, as a rule, very effective if used judiciously; but if added in excess, they cause the boiler to prime. Their presence prevents corrosion of the plates, and produces a deposit with little tendency to adhere.

One of the most successful of anti-incrustators is tri-basic phosphate of soda. It precipitates the calcium and magnesium salts in the water as a slimy mud which does not stick to the plates. Sal ammoniac is sometimes used with success, but its cost is almost prohibitive.

Besides the above saline anti-incrustators, organic substances, such as fats and oils, tannin, and kerosene oil, are used; but with the exception of the last-named substance, which seems to act mechanically, such bodies should be regarded with suspicion. A large number of patented compounds to prevent incrustation are also advertised, the basis of the majority being some form of alkali; they should not be used, however, unless their composition, as well as that of the water, is known.

Boiling. The act of boiling consists in the brisk transformation of a liquid into its vapor form. During the process the heat that is applied to produce the transformation is wholly used up in effecting the change, and the temperature of the liquid remains constant at what is called the *Boiling Point* (q. v.). For boiling of foods, see COOKERY.

Boiling Point, the temperature at which the vapor tension of any liquid equals the pressure of the surrounding atmosphere, causing boiling or ebullition. The boiling point of any liquid of definite constitution, therefore, will remain constant so long as the pressure does not vary, but will fall as the pressure is decreased, and rise as it is increased. Thus, water, which boils at 100° C. or 212° F. at normal atmospheric pressure, boils at 160° C. (320° F.) when the pressure is 6.12 atmospheres, and at 40° C. (104° F.) when the pressure is .027 atmosphere; and it is even possible to reduce the pressure so low as to bring the boiling point almost to the same value as the freezing point.

The relation of boiling point and pressure finds many practical applications, as in the use of vacuum pans in the manufacture of sugar (see SUGAR), and the preparation of chemical substances which would decompose at the normal boiling point of the mother liquor; in the construction of specially designed boilers for use in high altitudes, where the pressure is low and the boiling point not sufficiently high to insure proper cooking; and in the carrying out of chemical processes where the required reaction occurs at a higher temperature than the boiling point of the solution employed. Another important application is the hypsometric thermometer, which makes it possible with fair accuracy to determine the altitude of any given place by observing the temperature at which water boils (see LEVELLING).

Boiling Point of Liquids.

Liquids.	Boiling Point.	
	Degrees C.	Degrees F.
Ether	35	95
Chloroform	61.2	141
Alcohol	78.4	172.4
Benzene	80.4	176
Water	100	212
Turpentine	159	320
Aniline	184	363
Naphthalene (solid to 82° c.)	218	428
Glycerine	290	554
Olive Oil	300	599
Strong Sulphuric Acid	338	617
Mercury	357	675
Sulphur (solid to 114.5° c.)	444.6	833

When a liquid contains a solid in solution the boiling point is raised. Thus, it is necessary to raise brine to a higher temperature than 100° C. to make it boil. Furthermore, the boiling point does not remain stationary, as in the case of a pure liquid, but rises as the steam passes off and the solution becomes more concentrated. It is therefore possible to reach a temperature of 180° by means of a strong solution of calcium chloride. The molecular weight of the dissolved solid also bears a relation to the boiling point of the solution, the difference between the boiling points of a solution and of the pure solvent being inversely proportional to the molecular weight of the substance dissolved.

Boiling Point of Liquefied Gases.

Liquefied Gases.	Boiling Point.	
	Degrees C.	Degrees F.
Sulphur dioxide	− 10	14
Ammonia	− 33.5	− 27.4
Carbon dioxide	− 80	−110
Liquid air	−191.5	−313
Oxygen	−184	−295
Nitrogen	−195	−315.5
Argon	−186	−303
Hydrogen	−252.5	−423

Bois-Brûlés, bwä-brü-lā′ (also known as Half Breeds), a race of people in North America, the descendants of Canadian Frenchmen and Indian women. They now number less than 35,000, found chiefly in Canada.

Bois d'Arc, the OSAGE ORANGE (q. v.).

Bois Colombes, bwä cō-lônb′, commune, department Seine. France, to the northwest of Paris, Pop. 17,500.

Boise, boi′-zā, capital and largest city of Idaho, and county seat of Ada county, on the Boise River, and the Oregon Short Line and Intermountain Railroads; 435 miles northwest of Salt Lake City. Here are located the State Capitol, a Federal assay office, reclamation and forestry service headquarters, surveyor-general's office, internal-revenue office, land office, penitentiary, two hospitals, Carnegie library, and several excellent schools. There are a military post and soldiers' home, and a large natatorium supplied by natural hot water, which occurs in abundance in the vicinity. Business houses and residences are heated with this water.

A flourishing agricultural, horticultural, and stock-raising region lies about the city, and rich mines occur in the surrounding mountains. It is also an important trade centre for wool. According to the Federal Census for 1919, industrial establishments number 98, with $3,453,398 capital, and products valued at $3,883,280. The principal manufactures are candy, harness, cigars, trunks, doors, and sashes. Boise has the commission form of government. It was founded in 1863 as a military post. Pop. (1900) 5,957; (1910) 17,358; (1920) 21,393.

Boise Project, an undertaking authorized by the U. S. Government in 1902, to irrigate from the Boise River 353,941 acres nearly all in Idaho, in the counties of Ada, Boise, Canyon, and Elmore. The project provides reservoirs at Deer Flat (completed 1912) and Arrowrock (completed 1915) holding 457,000 acre feet; the Boise River diversion dam (completed 1908), 8 miles above Boise; and a system of canals for distribution of the water to the adjacent lands on both sides of the river. Construction was begun in 1905; 112,000 acres were irrigated and under cultivation in 1922. In addition to the project lands, storage water was served to 131,300 acres of land in the vicinity under Warren Act contracts by which crops to the value of $4,596,000 were raised in 1922. The net cost to that date was $12,731,410.

Boisgobey, bwä-gō-bā′, Fortuné du (1824–91), French novelist, was born in Granville, Normandy. For some time paymaster in the Algerian army, he devoted himself after 1868 to the writing of sensational detective novels. A close follower of Emile Gaboriau (q. v.), he has all his master's vigor and ingenuity; he lacks Gaboriau's sense of dramatic fitness, but his stories are at least always readable. Among the best are: *L'Homme sans nom* (1872); *Le Colonel Forçat* (1872); *L'As de cœur* (1875); *Les mystères de Nouveau Paris* (1876); *Le crime de l'Opera* (1880); *Le secret de Berthe* (1884).

Bois-le-Duc, bwä-le-dük′. See Hertogenbosch.

Boisserée, bwä-s-rā′; *Ger. pron.* boi-se-rā′, Sulpice (1783–1854), German writer on art, was born in Cologne. In 1838 he became professor of archæology at Bonn. With his brother Melchior (1786–1851) he formed (1803–19) at Stuttgart a collection of over two hundred old German pictures, all but forty of them now in the Pinakothek at Munich. His chief works are: *Geschichte des Doms von Köln* (1823–32); *Die Denkmale der Baukunst vom 7 bis 13 Jahrhundert am Niederrhein* (1831–3).

Boissier, bwä′syā′, Marie Louis Gaston (1823–1908), French writer, was born in Nîmes. He was professor of rhetoric at Angoulême (1846), at Nîmes (1847–57), and at the Lycée Charlemagne, Paris (1857–61), and of Latin eloquence and subsequently of the history of Latin literature in the Collège de France (1861–1906). He was elected to the French Academy in 1876 (secretary 1895–1908), and to the Academy of Inscriptions and Belles-Lettres in 1886. His works, distinguished for clearness, vividness, accuracy, and charm of style, include: *Etude sur Terentius Varron* (1859); *Cicéron et ses amis* (1865; 12th ed. 1902); *L'Opposition sous les Césars* (1875; 4th ed. 1900); *La religion romaine d'Auguste aux Antonins* (1874; 5th ed. 1901); *Promenades archeologiques: Rome et Pompéi* (1880, 1896); *L'Afrique Romaine* (1895); and biographies of Madame de Sévigné and Saint-Simon.

Boissieu, bwä′sye, Jean Jacques de (1736–1810), French painter and engraver, was born in Lyons, and studied there under Lombard and J. C. Frontier. His 140 etchings, most of them after original designs, are regarded as the best work of the kind of that period. Among his paintings are: *Italian Landscape, with Women Washing* (Paris); *Hilly River Landscape* (Berlin).

Boissonade, bwä-sō-nȧd′, Jean François (1774–1857), French classicist, was born in Paris. He became professor of Greek in the University of Paris (1812), and in the Collège de France (1828). His more important works are: *Philostrati Heroica* (1806); *Marini Vita Procli* (1814); *Tiberius Rhetor de Figuris* (1815); *Sylloge Poetarum Græcorum* (1826); *Babrii Fabulæ* (1844).

Boissy d' Anglas, bwä-sē′ däṅ-glȧs′, François Antoine, Comte de (1756–1826), French statesman, was born at St. Jean le Chambre, in Ardèche. He was elected a deputy of the States-General; became a member of the Convention; opposed the execution of Louis XVI.; and helped to overthrow Robespierre in 1794. In the same year he became secretary to the National Convention, and was afterward a member of the Committee of Public Safety, and president of the Council of Five Hundred. He was created a senator by Napoleon (1805) and was made a peer by Louis XVIII. He wrote *Recherches sur la vie de Malesherbes* (1819–21); *Etudes littéraires et poétiques d'un vieillard* (1826).

Boito, bō-ē′tō, Arrigo (1842–1918), Italian composer and poet, was born in Padua. He received a musical education at Milan, and composed, with Faccio, a cantata, *Le Sorelle d'Italia* (1862), which achieved considerable success. His opera *Mefistofele*, produced in Milan in 1868, was a failure, but Boito remodelled the piece, and it was successfully produced in Bologna (1875) and other cities of Europe. While never achieving great popularity, *Mefistofele* is to be ranked among the most important operas of the nineteenth century, as it marks the transition to the new Italian dramatic school. It was sung in New York in 1883, 1896, and 1900. Three later operas, *Ero e Leandro*, *Nerone*, and *Orestiade* have never been produced. Besides writing his own librettos, Boito performed the same office for other composers (*Gioconda* for Ponchielli, *Otello* and *Falstaff* for Verdi, *Amleto* for Faccio). As a poet he used the *nom de plume* Tobia Gorrio.

Bojador, Cape, boj-a-dōr′; *Port. pron.*, bō-zhä-dōr′, a headland on the west coast of Africa, in 26° 7′ n. lat., 14° 29′ w. long. The Portuguese doubled this cape in 1432.

Bojano, bō-yä′nō, city and episcopal see, province of Campobasso, Italy; 18 miles southwest of Campobasso. It has a cathedral, a seminary, and several churches. It was the Samnite *Bovianum*, and there are ruins of a Roman theatre, a temple, and the ancient city walls. Pop. (1911) 6,439.

Bojer, bō′yĕr, Johan (1872–), Norwegian author, was born in Orkedalsoren, near Trondhjem. His first books *En Moder* ('A Mother') and *Helga*, published in 1894–5, were well received, and from that time he devoted himself to authorship. From 1899 to 1907 he lived in France, Italy, Denmark, Germany, and England, but returned to Norway to make his home. Among his writings are: *Paa Kirkever* ('At the Churchyard Gate,' 1897); *Rorfloiterne* ('The Wind in the Reeds,' 1898); *Et Folketoz* (1896); *Moder Lea* (1900); *Troens Magh* ('The Power of a Lie,' 1903; Eng. trans. 1920); *Liv* ('Life,' 1911; Eng. trans. 1920); *Den Store* ('Hunger,' 1917; Eng. trans. 1919); *Kjaeligheten's Oine* ('The Eyes of Love,' 1909; Eng. trans. 1919); *Verdens Ansigt* ('The Face of the World,' Eng. trans. 1919); *Dijrendal* ('God and Women,' 1919; Eng. trans. 1921); *Den siste viking* (1921).

Bok, Edward William (1863–), American editor, was born in Helder, Netherlands, and removed to the United States with his parents in 1869. He was educated in the Brooklyn (N. Y.) public schools, became editor of *The Brooklyn Magazine* (1882); founder and manager of the Bok Syndicate Press (1886–91); and editor of *The Beecher Memorial* (1887). He was editor-in-chief of *The Ladies' Home Journal* (1889–1919) and after 1891 was vice-president of the Curtis Publishing Company, Philadelphia. In July, 1923, he offered a prize of $100,000 for a practicable plan to enable the United States to co-operate with the nations of the world in keeping world peace. His *Americanization of Edward Bok*, published in 1920, was awarded the Pulitzer Prize, as the best biography of that year.

died Jan 9. 1930.

Insert in Vol. II, following page 174

The Bok Peace Award

On July 2, 1923, Edward W. Bok announced an offer of a prize, thereafter known as the American Peace Award, of $100,000 to the American who should conceive the most practicable plan by which the United States might co-operate with other nations to preserve world peace. To determine the conditions of award and to name a jury to select the winning plan, a policy committee was appointed, consisting of:

John W. Davis
Learned Hand
William H. Johnston
Esther Everett Lape
Nathan L. Miller
Mrs. Gifford Pinchot
Mrs. Ogden Reid
Mrs. Franklin D. Roosevelt
Henry L. Stimson
Melville Stone
Mrs. Frank A. Vanderlip
Cornelius N. Bliss, Jr.

By the conditions of the contest, announced July 23, it was specifically provided that the winning plan must furnish a practical means whereby the United States might take its place and do its share toward preserving world peace, while not making compulsory its participation in European wars, if any such should, in the future, be found unpreventable. It was further stated that the plan might be based on the Covenant of the League of Nations (q. v.), or might be entirely apart from that instrument. The contest was open to every citizen of the United States, by birth or by naturalization, as well as to national, State, and local organizations.

Since the purpose was not only to produce a plan but also to insure, so far as might be, that it would be put into operation, it was specified that the award would be made in two payments —$50,000 upon the selection of the plan by the jury of award, and an additional $50,000 when the plan should be approved by the U. S. Senate or when the jury of award should decide that an adequate degree of popular support had been demonstrated for the winning plan (to be secured by popular referendum).

In order that there might be no question of the award being made solely upon the basis of merit, no plan was to bear any evidence of the identity of its author, whose name and address were to be attached to the manuscript in a sealed envelope.

The Jury of Award consisted of:

Elihu Root, Chairman
James Guthrie Harbord
Edward M. House
Ellen Fitz Pendleton
Roscoe Pound
William Allen White
Brand Whitlock

The contest closed at midnight Nov. 15, 1923, and the prize-winning plan, one of 22,165 submitted, was announced Jan. 7, 1923. It proposed immediate adherence, on the part of the United States, to the Permanent Court of International Justice, and full co-operation with the League of Nations under certain important conditions, without, at present, assuming full membership.

Beginning with the significant statement that 'five-sixths of all nations, including about four-fifths of mankind, have already created a world organization, the purpose of which is "to promote international co-operation and to achieve international peace and security",' the plan sets forth the proposition that 'the only possible path to co-operation in which the United States can take an increasing share is that which leads toward some form of agreement' with this organization. It then proceeds to review the part already taken by the United States in the operations of the League of Nations.

'The United States Government accredited its representatives to sit as members "in an unofficial and consulting capacity" upon four of the most important social welfare commissions of the League, *viz.*: Health, Opium, Traffic in Women and Children, and Anthrax (Industrial Hygiene).

'Our Government is a full member of the International Hydrographic Bureau, an organ of the League. Our Government was represented by an "unofficial" observer in the Brussels Conference (Finance and Economic Commission) in 1920. It sent Hon. Stephen G. Porter and Bishop Brent to represent it at the meeting of the Opium Commission last May.

'Our Public Health Service has taken part in the Serological Congresses of the Epidemics Commission and has helped in the experimental work for the standardization of serums.

'Our Government collaborates with the League Health Organization through the international Office of Public Health at Paris, and with the Agriculture Committee of the League Labor Organization through the International Institute of Agriculture at Rome. . . .

'Unofficial co-operation from the United States with the work of the League includes membership in five of the social welfare commissions or committees of the League, in one on economic reconstruction, and in one (Aaland Islands) which averted a war. American women serve as expert Assessors upon the Opium and Traffic in Women Commissions.'

The question remaining then is one of *increasing co-operation* between the United States and the organized world for the promotion of peace and security, in some form acceptable to the people of the United States and 'hopefully practicable.' A number of suggestions are offered:

(1) An expression on the part of the United States of its willingness to 'co-operate similarly with the other reconstructive agencies of the League.'

(2) Extension of the same kind of co-operation, when this is requested, to 'include participation in the work of the commissions and technical committees of the Labor Organization' whose purpose it is to collect and study information on which may be based subsequent recommendations for national legislation. In this connection it is pointed out that all conventions and resolutions recommended by the first three congresses of the International Labor Organization have already been laid before the Senate of the United States and, without objection, referred to the appropriate committee. No different procedure would have been followed if the United States were a member of the Labor Organization of the League.

(3) Approval by the Senate of the proposal that the United States adhere to the Permanent Court of International Justice, for the reasons and under the conditions stated by Secretary Hughes and President Harding in February, 1923.

'These three suggestions for increasing co-operation with the family of nations are in harmony with policies already adopted by our Government, and in the last case with a policy so old and well recognized that it may now be called traditional.

'They do not involve a question of membership in the League of Nations as now constituted, but it cannot be denied that they lead to the threshold of that question. Any further step toward co-operation must confront the problem of direct relations between the United States and the Assembly and Council of fifty-four nations in the league.'

At this point the plan presents a brief review of the actual operation of the League of Nations since its inception, showing how most of the scruples and fears with which the League was regarded by some have been dissipated or disproved by the way in which it has interpreted its authority and directed its activities. This has to do chiefly with articles x. and xvi. (see League of Nations). 'Experience in the last three years,' says the plan, 'has demonstrated probably insuperable difficulties in the way of fulfilling in all parts of the world the large promise of Article x. in respect to either its letter or its spirit. No one now expects the League Council to try to summon armies and fleets. . . .

'As to Article xvi., the Council of the League created a Blockade Commission which worked for two years to determine how the "economic weapon" of the League could be efficiently used and uniformly applied. The Commission failed to discover any obligatory procedure that weaker Powers would dare to accept. It was finally agreed that each State must decide for itself whether a breach of the Covenant has been committed.

'The Second Assembly adopted a radically amended form of Article xvi. from which was removed all reference to the possibility of employing military force, and in which the abandonment of uniform obligation was directly provided for.

'Articles x. and xvi., in their original forms, have therefore been practically condemned by the principal organs of the League. . . . The only kind of compulsion which nations can freely engage to apply to each other in the name of Peace is that which rises from conference, from moral judgment, from full publicity, and from the power of public opinion.'

The plan then points out the unwillingness of the League to intervene in any American controversy, as evidenced by its attitude toward the Panama-Costa Rica dispute in 1921 and in the Chile-Peru-Bolivia difficulties, and its obvious intention to recognize the leadership of the United States in the New World.

The present standing of the League and the attitude of the United States, it sums up as follows:

'The operation of the League has therefore evolved a Council widely different from the body imagined by the makers of the Covenant. It can employ no force but that of persuasion and moral influence. Its only actual powers are to confer and advise, to create commissions, to exercise inquisitive, conciliative and arbitral functions, and to help elect judges of the Permanent Court. . . .

'It is common knowledge that public opinion and official policy in the United States have for a long time, without distinction of party, been favorable to international conferences for the common welfare, and to the establishment of conciliative, arbitral and judicial means for settling international disputes.

'There is no reason to believe that the judgment and policy have been changed. Along these same lines the League is now plainly crystallizing, as has been shown, and at the touch of the United States the process can be expedited.

'In no other way can the organized world, from which the United States cannot be economically and spiritually separated, belt the power of public opinion to the new machinery, devised for the pacific settlement of controversies between nations and standing always ready for use.'

Then follows the proposal that the 'United States Government should be authorized to propose co-operation with the League and participation in the work of its Assembly and Council' under certain conditions and reservations. These conditions and reservations we quote in full.

'I. The United States accepts the League of Nations as an instrument of mutual counsel, but it will assume no obligation to interfere with political questions of policy or internal administration of any foreign state.

'In uniting its efforts with those of other states for the preservation of peace and the promotion of the common welfare, the United States does not abandon its traditional attitude concerning American independence of the Old World and does not consent to submit its long-established policy concerning questions regarded by it as purely American to the recommendation or decision of other Powers.

'II. The United States will assume no obligations under Article x. in its present form in the Covenant, unless in any particular case Congress has authorized such action.

'The United States will assume no obligations under Article xvi. in its present form in the Covenant or in its amended form as now proposed, unless in any particular case Congress has authorized such action.

'The United States proposes that Articles x. and xvi. be either dropped altogether or so amended and changed as to eliminate any suggestion of a general agreement to use coercion for obtaining conformity to the pledges of the Covenant.

'III. The United States Government will accept no responsibility and assume no obligation in connection with any duties imposed upon the League by the peace treaties, unless in any particular case Congress has authorized such action.

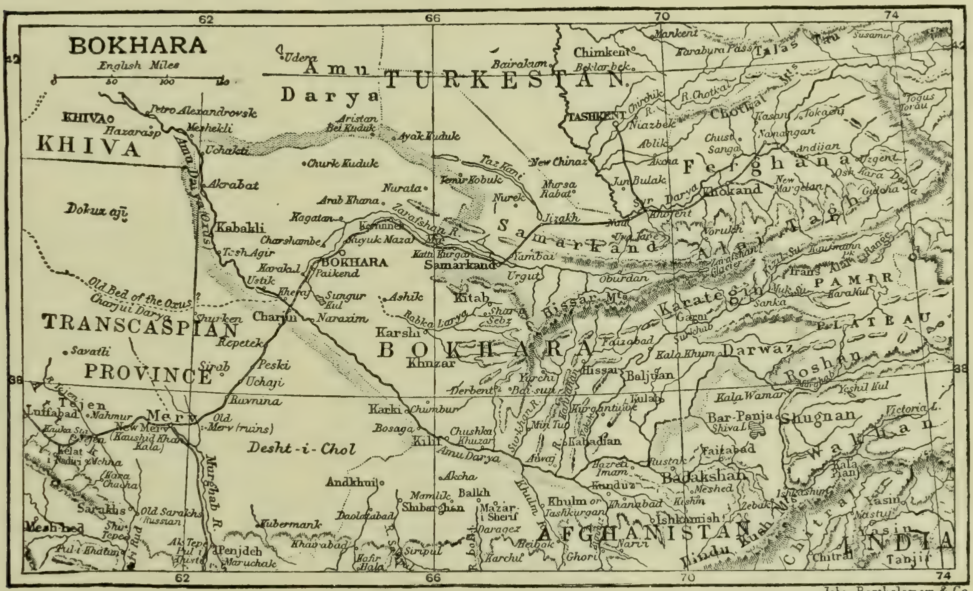
'IV. The United States Government proposes that Article I. of the Covenant be construed and applied, or, if necessary, redrafted, so that admission to the League shall be assured to any self-governing State that wishes to join and that receives the favorable vote of two-thirds of the Assembly.

'V. As a further condition of its participation in the work and counsels of the League, the United States asks that the Assembly and Council consent—or obtain authority—to begin collaboration for the revision and development of international law, employing, for this purpose, the aid of a commission of jurists. This commission would be directed to formulate anew existing rules of the law of nations, to reconcile divergent opinions, to consider points hitherto inadequately provided but vital to the maintenance of international justice, and in general to define the social rights and duties of States. The recommendations of the commission would be presented from time to time, in proper form for consideration, to the Assembly as to a recommending if not a law-making body.'

Boke, bō′kā, a fortified station of West Africa, in French Guinea, on the Nuñez River, about 50 miles from its mouth, and at the head of navigation when the tide is high.

Bokelmann, bō′kel-män, CHRISTIAN LUDWIG (1844–94), German painter, was born in St. Jurgen, near Bremen. After several years spent in business he began his career as an artist, and in 1893 was appointed professor in the Academy at Berlin. His canvases display realistic conception, a fine eye for character, and telling arrangement. Among his best known works are: *In the Pawnshop* (1875, National Gallery, Stuttgart); *An Itinerant Stall Before Christmas* (1878); *The Emigrants* (1882, Museum at Dresden); *The Gaming Tables at Monte Carlo* (1884); *The Opening of the Will* (1879, National Gallery, Berlin); *The Arrest* (1881, Museum at Hanover).

Bo′ker, GEORGE HENRY (1823–90), American poet and dramatist, was born in Philadelphia. He was graduated from Princeton (1842), and subsequently made a tour of Europe. His tragedy *Calaynos* was successfully produced in London in 1849, and was followed in quick succession by *Anne Boleyn*, *Leonor de Guzman*, and the well known *Francesca da Rimini*. During the Civil War he wrote several patriotic poems which had a wide circulation, and were collected as *Poems of the War* (1864). He served as U. S. Minister to Turkey (1871–5) and to Russia (1875–9). His other works include the dramas *The Betrothed*, *The Widow's Marriage*, *All the World a Mask*, and the poems *The Lesson of Life* (1847), *Plays and Poems* (1856), *Street Lyrics* (1865), *Königsmark, and Other Poems* (1869), *The Book of the Dead* (1882), *Sonnets* (1886).



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Bokhara, bō-kä′rä, formerly a Russian protectorate of Central Asia, now joined with Khiva to form the Socialist Soviet Republic of Uzbek. It is bounded on the north by the Russian provinces of Syr Daria, Samarkand, and Fergana; on the east by the Pamir region; on the south by Afghanistan; and on the west by the Transcaspian Territory and Khiva. Area, about 79,000 square miles.

The middle and eastern portions, comprising more than two-thirds of the country, are rugged and mountainous, while the western portion is divided between steppe and desert region. The chief rivers are the Amu Daria (Oxus), which flows through Bokhara in a northwesterly direction to the Sea of Aral, and divides the country from Afghanistan on the south; the Zerafshan, which rises in the mountains of the east, issues into the plain near Samarkand, and waters the western steppes; and the Karshi, which has its source in the highlands, and loses itself in the desert after a course of 60 miles. Numerous smaller streams fed by the mountain snows empty themselves into these three rivers.

The soil in the river valleys and oases is very fertile; but the climate is excessively dry, especially during the summer months, and agriculture is wholly dependent on irrigation. Wheat, barley, rice, durra, lucerne, sesame, millet, cotton, hemp, tobacco, and fruits are raised—especially melons, figs, quinces, peaches, apricots, plums, and pomegranates. The mulberry tree thrives everywhere, and silk culture is an important industry. Sheep, goats, camels, and horses are bred.

Gold occurs in the basins of the Amu Daria and the streams along its upper reaches. Salt deposits are numerous. Alum and sulphur are found in the vicinity of Samarkand, and sal-ammoniac in the mountainous districts. Manufactures consist principally of textile fabrics, made by hand, and the rugs for which the country is famous. Boots and saddles, weapons, cutlery, and pottery are also manufactured. Trade is carried on chiefly with Russia, India, and Persia, special concessions being enjoyed by Russian traders. Silk, cotton, lambskins, and agricultural products are exported; tea, indigo, muslins, drugs, and manufactured articles are the leading imports. The Amu Daria River, which traverses the southern border, and the Transcaspian Railway, which crosses the country from southwest to northeast, are the chief means of communication; the rest of the country is served by caravan routes.

The *population* of Bokhara is estimated at about 3,000,000. The two principal races are the Uzbegs (q. v.), to whom the reigning house formerly belonged, and the Tajiks (q. v.). The remaining population includes Persians, Hindus, Afghans, Kirghiz, and Turkomans, with an increasing colony of Russians along the line of the Transcaspian Railway. The principal towns are Bokhara (pop. 75,000), Karshi (25,000), Khuzar, Shahr-i-Zabz, Hissar, Charjui, Karakul, and Kermineh.

Bokhara was formerly an absolute monarchy ruled by the *Emir* (Ameer) under the suzerainty of Russia, who represented Bokhara in all foreign relations, but in 1919 the Emir was expelled and a Soviet government was set up. Mohammedanism is the established religion; education is wholly along Mussulman lines. There are about 2,000 primary schools, and many *medresses* or higher schools.

History.—Bokhara was conquered in the seventh century by the Arabs, who were dispossessed in 1232 by Jenghiz Khan. It rose to a position of great political and commercial importance under Timur Beg (1336–1405), but in 1505 was taken by the Uzbegs. It came under Russian domination in 1868; and during the invasion of Khiva (1873) the khan assisted the Russians, and was rewarded by a large addition to his territory from the Khivan possessions on the Amu Daria. Under Abd-ul-Ahad (1885–1911), whose mental and physical weakness rendered him anxious to secure the protection of Russia, a Russian political agent was appointed, a Russian bank was established in Bokhara, and the country was practically absorbed into Russian Turkestan, in which the annexation of Merv in 1884 enclosed it. In 1919, after a revolution, a Soviet government was set up and in 1924 Bokhara and Khiva united to form a Soviet Socialist Republic.

Consult Vambéry's *Travels in Central Asia*, *Sketches of Central Asia*, and *History of Bokhara;* Curzon's *Russia in Central Asia*, and *The Pamirs and the Source of the Oxus;* Le Messurier's *From London to Bokhara;* Skrine and Ross' *The Heart of Asia;* O. Olufsen's *The Emir of Bokhara and His Country* (1911).

Bokhara, capital of the Soviet Republic of Uzbeg, is situated in the lower valley of the Zerafshan, in the midst of trees, gardens, and orchards. It is surrounded by embattled walls of loess, about 24 feet high, pierced by eleven gates. The streets, for the most part unpaved, are narrow and winding, and are intersected by canals, which distribute the waters of the Zerafshan throughout the city. The houses are flat-roofed structures of loess. On an eminence in the centre of the town stands the Emir's old castle, the 'Ark,' surrounded by a wall 60 or 70 feet high, which encloses as well the harem, state prison, and treasury. There are numerous bazaars, market places, mosques, and *medresses*, or colleges for Mohammedan students. One of the most beautiful mosques is Mashit-i-Kalân, attached to which is the Tower of the Dead, from which criminals were formerly hurled to death.

Commercially, Bokhara is the most important city of Central Asia. Manufacturing is carried on to some extent, but is in the hands of small artisans. Tajiks form three-fourths of the population; Uzbegs, Jews, Hindus, Kalmuks, and Afghans make up the remainder. Bokhara was a centre of Moslem civilization in the ninth and tenth centuries, and became an Asiatic capital under the Uzbeg Khans. Pop. 75,000.

About 10 miles to the southeast is NEW BOKHARA, a station on the Transcaspian Railway, where Russian colonists and merchants are settled. Pop. 3,000.

Boks'burg, town, Transvaal, South Africa; 15 miles east of Johannesburg. It is an important gold mining centre and has several good public buildings and a fine park. Pop. (1922) 37,979, of whom 12,416 are white.

Bol, bōl, FERDINAND (1616–80), Dutch painter, was born in Dordrecht. He studied under Rembrandt, becoming one of his most distinguished pupils. He first painted portraits after Rembrandt, but later came under the influence of the Flemish historical painters. Several of his pictures are at the Hermitage, St. Petersburg (Leningrad). His chief work is *The Regents of the Leprosy Hospital* (1649, Amsterdam). Of his other paintings, Amsterdam possesses a portrait of Admiral de Ruyter; the National Gallery, London, has the *Portrait of an Astronomer;* the Louvre and many other Continental galleries (especially Dresden) have Scriptural and allegorical pictures.

Bola-Bola, one of the Society Islands. See BORA-BORA.

Bolama, bō-lä'ma, island, West Africa, one of the Bissagos Archipelago, belonging to Portugal. Pop. 4,000. Its largest town, BOLAMA, is the capital of Portuguese Guinea.

Bolan Pass, bō-län', a narrow gorge, hemmed in by steep cliffs, ascending, in a northwest direction, from the plains of Karachi (Kurch Gandawa) across the Hala Mountains to the highlands of Sarawan, Baluchistan. The pass is about 60 miles long, and its summit is 5,900 feet above sea level. It is traversed by a military road that repeatedly crosses the Bolan River; and by the railway between Sibi and Quetta.

Bolaram, bō-lä'ram, military cantonment, India, in Nizam's Dominions, 6 miles north of Secunderabad and now incorporated with it. It is the seat of military headquarters offices, its climate, owing to its elevation (1,900 feet), being salubrious. Pop. 10,000.

Bo'las, a weapon and hunting implement used by the Patagonians, Araucanians, and other tribes of the South American pampas. In its older form it consisted of two stone balls, grooved to hold a leather thong by which they were joined; in its modern form it consists of three balls connected by three cords of almost equal length. In use the weapon is whirled about the head and thrown at a running animal, so that the balls wind round its feet and bring it to the ground. The Eskimos of Alaska use small bolas of ivory for catching birds.

Bolbec, bōl-bek', town, France, in the department of Seine-Inférieure, 20 miles east of Havre. Industries include cotton and wool spinning, weaving, dyeing and bleaching, paper making, and tanning. Pop. (1921) 10,439.

Boldini, bol-dē'nē, GIOVANNI (1845-), Italian portrait and genre painter, was born in Ferrara, and was educated at the Academy of Florence. He devoted himself to portrait painting in London until 1872, when he removed to Paris, where he has been associated with the modern Parisian school. Among his works are: *The Portrait of a Lady* and *Au Luxembourg* (Paris); *Ladies of the First Empire* and *Des Parisiennes* (New York City); portraits of Menzel (Berlin) and Whistler (Brooklyn); *The Spanish Dancer; Repose in the Atelier; The Connoisseur; Gossip; Kitchen Garden; Day Dreams; Fishing on the Seine; Delivering the Despatch.*

Boldrewood, bōl'd'r-wood, ROLF (1826–1915), the pseudonym of THOMAS ALEXANDER BROWNE, Anglo-Australian novelist, was born in London. In 1844 he settled in Victoria as a squatter and became a police magistrate and warden of the New South Wales gold fields. His first and best work of fiction was *Robbery under Arms* (1888). His other works include: *The Miners' Right* (1890); *The Squatter's Dream* (1895); *Plain Living* (1898); *The Babes in the Bush* (1900). In *Old Melbourne Memories* (1895) he has given a vivid account of his early experiences as a squatter.

Bole, an earthy, finely pulverulent mineral, mostly brown, but in some varieties red or yellow, found in the cavities of basaltic igneous rocks. It is employed chiefly as a pigment, and was formerly used in medicine. It is found in the Greek island of

Lemnos, in Sicily, Armenia, Silesia, and South America.

Bolero, bō-lā'rō, a Spanish national dance, invented in 1780 by Sebastian Zerezo. It is danced in moderately quick three-quarter time by two persons to the accompaniment of castanets and guitar. The name is also applied to the air to which it is danced. Like the *fandango* (q. v.) it is said to be originally a refinement of an African dance.

Bole'tus, a genus of hymenomycete fungi, including about 100 European species, most of them resembling the common mushroom and other species of Agaricus. Instead of gills, however, they have a distinct layer on the under side of the cap, dotted with pores, which are the orifices of hundreds of tiny tubes, containing the spore cases. Many of the species are edible, but a few are poisonous. *B. edulis,* the *ceps ordinaire* of the French markets, grows on the ground in places covered with heath, moss, or grass, and is wholesome and nutritious. Only the flesh of the cap is eaten.

Boleyn, bo͝ol'*e*n (Bullen), Anne (?c. 1503–36), daughter of Thomas, a country gentleman, by Elizabeth, daughter of Thomas Howard, earl of Surrey, and later duke of Norfolk. Helped by the latter's favor, Bullen became a knight, crown officer, and ambassador; by Anne's, earl of Wiltshire and Ormond. He placed Anne at the French court (1514–21), then recalled her to that of Henry VIII. Her sister Mary was already there, married and the king's mistress—more to her father's profit than her own. Anne, a striking and clever brunette, had some futile courtships; but in 1526 she attracted Henry. He was a notoriously brief, stingy and unchivalrous lover, and she shrewdly held out for marriage. Anxious to have a legitimate son, vexed at Catherine's foreign leanings, and galled by her scant personal respect, Henry set about getting rid of her. When Cranmer's near primacy assured this, Anne, for the marquisate of Pembroke to herself and children, became in September, 1532, Henry's experimental wife; later he married her (about Jan. 25, 1533). The child was born on Sept. 7, but proved to be a daughter—Elizabeth. Two worse disappointments quenched Henry's hopes.

Though lending himself to Anne's persecutions and menaces of Catherine and Mary, to the extent possibly of compassing Catherine's death, Henry early hated her for her unbridled ill temper, jealousy, and impatient scorn. He therefore thought of divorcing her, but this meant taking back Catherine and relegitimating Mary; and after Catherine's death he chose rather to have his secretary, Thomas Cromwell, find pretext for the death of Anne. The latter was a vain, unqueenly woman, fond of gross flirtations; but much more was needed, and the charges affront human reason and decency: five adulteries, including incest with her brother George, Lord Rochford (amid a swarm of female spies, mostly disliking her, and no breath reaching Henry); with a conspiracy to murder him her sole bulwark against a mass of popular hatred as an enthroned concubine, causing national schism, shame, and hard times from European broils. In his fashion, Henry made the organs of public justice and his victims' families do his ugly work. Only one 'confessed' under torture, perhaps hoping pardon, or preferring the axe to further racking. Anne and Rochford were tried by peers, including their father and uncle (Norfolk), whose struggle would ruin themselves without saving them, and who had enough 'evidence' before them to quiet conscience and qualm. All five of her alleged paramours were executed. Meantime, Jane Seymour had successfully imitated Anne; but Henry, fearing further failure, in order to legitimate his natural son had Cranmer pronounce Anne's marriage invalid (on secret grounds, pretty certainly as marrying her sister's paramour). Anne was beheaded on May 19, 1536, and Henry married Jane the next day. Consult Paul Friedmann's *Anne Boleyn;* Martin Hume's *The Wives of Henry VIII.* (1905); works cited under Henry VIII.

Bolgary, bol-gä'ri, Bolghar, or Bolgara, village, Kazan government, Russia, on the River Volga; 80 miles south of Kazan, on the site of the ancient capital of the old Bulgarians. The town was destroyed by Tamerlane in the fourteenth century. Here, during excavations begun in 1722, many ancient coins and inscriptions were found. The Bulgarians of Bolgary were converted to Islam about 920, and were subsequently visited by Moslem travellers, especially Ibn Batuta, about 1335. During these ages Bolgary was an entrepôt of trade between Scandinavians, Russians, and other Europeans to the west and northwest, and Khazars and Moslems to the south and southeast.

Bolgrad, bōl-gräd, town, Bessarabia, government, Russia; 25 miles north of Ismail. It is well built; has manufactures of soap, candles, and pottery. Pop. 15,000.

Boli, bō'lē, or Boly, town, vilayet Kastamuni, Turkey; 135 miles east of Constantinople, on the caravan route from that city to Erzerum. It has leather, cotton, and wool industries, and trade in timber. Pop. 11,000.

Bo'lide is a name given to a large meteor which explodes and falls in aerolites; a fire-ball. See Meteors.

Bolingbroke, bol'ing-bro͝ok, Henry St. John, Viscount (1678–1751), English statesman and speculative writer, grandson of Robert Rich, second earl of Warwick, grantor of Connecticut. He was educated at Eton, and in a long foreign tour became steeped in French speech, literature, deism, and morals. Tall, handsome, and brilliant, of extreme charm to both sexes, he prided himself through life on combining the highest powers of intellect and active life with every sensuous indulgence — 'a modern Alcibiades or Petronius.' Entering Parliament in 1701 as a Tory, he speedily became a leader from matchless oratory and knowledge of foreign affairs; and in 1704–8 was Secretary for War in Anne's Godolphin ministry, carrying on the War of the Spanish Succession. Quitting office in 1708, he came back in 1710 as Privy Councillor and Secretary of State; in 1711 was made viscount; and in 1712 negotiated the Peace of Utrecht—in itself right, but in manner and many details repugnant to national honor, and never forgotten against him.

For succession to Queen Anne Bolingbroke followed the numerical majority in favoring the Old Pretender against George of Hanover, and was packing the chief posts with Jacobites when Anne's sudden death enabled the Whigs, strongest in the governing classes, to proclaim George I. Doubtless Bolingbroke, who knew the Catholic 'James III.' could not accede without civil war, was only playing for Whig bids; but he was turned out, shortly fled to France, and in 1715 was attainted. He became Secretary of State to the Pretender, but was overridden by fanatical refugees and priests, and after the rising of 1715 (made against his advice) was dismissed. While abroad he wrote *Reflections upon Exile* (1716), and the autobiographic *Letters to Sir William Windham* (1717), his best work.

In 1723 Bolingbroke procured a pardon from George I., and in 1725 his estates were restored. Casually writing to Pope the religious philosophy later versified in the *Essay on Man* (1733), he attempted regaining political primacy through Pulteney's break with Walpole. He assailed the ministry in letters to the *Craftsman* (reprinted 1735 as *Dissertation on Parties*); gained great influence over George II.; and seemed about to replace Walpole when the King died.

In 1735 he retired to France, where he made some vain attempts to regain English position, and wrote much that was posthumously published: *True Use of Retirement, Study and Use of History, Spirit of Patriotism,* and the *Idea of a Patriot King* (1738). The last had a curiously tenacious influence for a century, inspiring Tory politicians from Bute to Disraeli, and George III.; yet a mere impractical vision from conflict with the bases of English government. In truth, Bolingbroke's writings, like his statesmanship, are at bottom little but rhetoric or party weapons, for immediate surface purposes; and his shallow deism has no seed of growth. Selfish opportunism was his life, and is his death. His biography was written by Goldsmith, Thomas Macknight, and Arthur Hassall. John Churton Collins gives a study of brilliancy and over-estimate. Consult also Leslie Stephen's *Religious Thought in the Eighteenth Century* (1876); Walter Bagehot's review of Macknight in his *Works.*

Bolintineanu, bō-lēn-tē-ne-än′, DIMITRIE (1826–72), Roumanian poet, was born in Bolintin, near Bucharest. He founded the *Dimbovitza* (1861), in which he vigorously sustained the popular cause against the boyars, and was minister of education in 1864, when Prince Cuza introduced his popular reforms. Bolintineanu's works, which include some of the best poetry in the language, are the collections *Cantece si Plangeri; Legendele Nationale; Basmele; Florile Bosforului.*

Bolivar, bol′i-var; *Span. pron.* bō-lē′vär, department of Colombia, South America, bounded on the north and west by the Caribbean Sea, on the east by the departments of Magdalena and Santander, on the south by Antioquía, and on the southwest by Cauca. The surface is generally low and thickly wooded, and is watered in the east by the Magdalena and Cauca Rivers, and in the west by the Sinu and its tributaries. The climate is tropical, except in the southern highlands. Cattle raising is an industry of first importance, and many cattle are exported. Horses, donkeys, and mules are also bred. Timber, tanning materials, dyewoods, resins, medicinal plants, and some rubber are derived from the forests. Maize, rice, bananas, coffee, cocoa, sugar, tobacco, and cotton are extensively cultivated. Deposits of gold and coal occur. Capital, Cartagena. Area, 22,320 square miles. Pop. (1912) 420,730.

Bolivar, largest state of Venezuela, South America, extends along the southern bank of the Orinoco and Apure Rivers, and is bounded on the west by Colombia, on the south by the territory of Alto Orinoco and Brazil, and on the east by British Guiana. It includes the gold-mining territory of Yuruari. Besides the wooded hills of the gold country, there are vast stretches of savannah, which have proved excellent for cattle breeding. The forests, which cover much of the state, yield copaiba balsam, rubber, and Tonka beans. Tobacco, coffee, and cinchona are produced, and sugar cultivation is an important industry in the eastern districts, where there are many plantations and mills. Capital, Ciudad Bolivar. Area, 90,440 square miles. Pop. 60,000.

Bolivar, province of Ecuador, located on the central plateau of that country. It is heavily wooded, and has forestry, agricultural, and pastoral resources. Capital, Guaranda. Area, 1,260 square miles. Pop. 45,000.

Bolivar, SIMON (1783–1803), South American patriot, known as 'the Liberator,' was born in Carácas, Venezuela, of a noble Spanish family. He was educated in Madrid, and visited Paris in 1801 and 1803, returning by way of the United States in 1809. He early identified himself with the movement for the independence of Venezuela; was appointed lieutenant-colonel of the revolutionary army; and was sent on a diplomatic mission to England, whose aid he invoked on behalf of the patriot cause. Shortly after his return, the declaration of Venezuelan independence was issued (July 5, 1811), and a long struggle for the mastery ensued between Spain and her recalcitrant colonies. Bolivar distinguished himself in a number of successful engagements under General Miranda; but the royalists eventually gained possession of the country, and he fled to Curaçao.

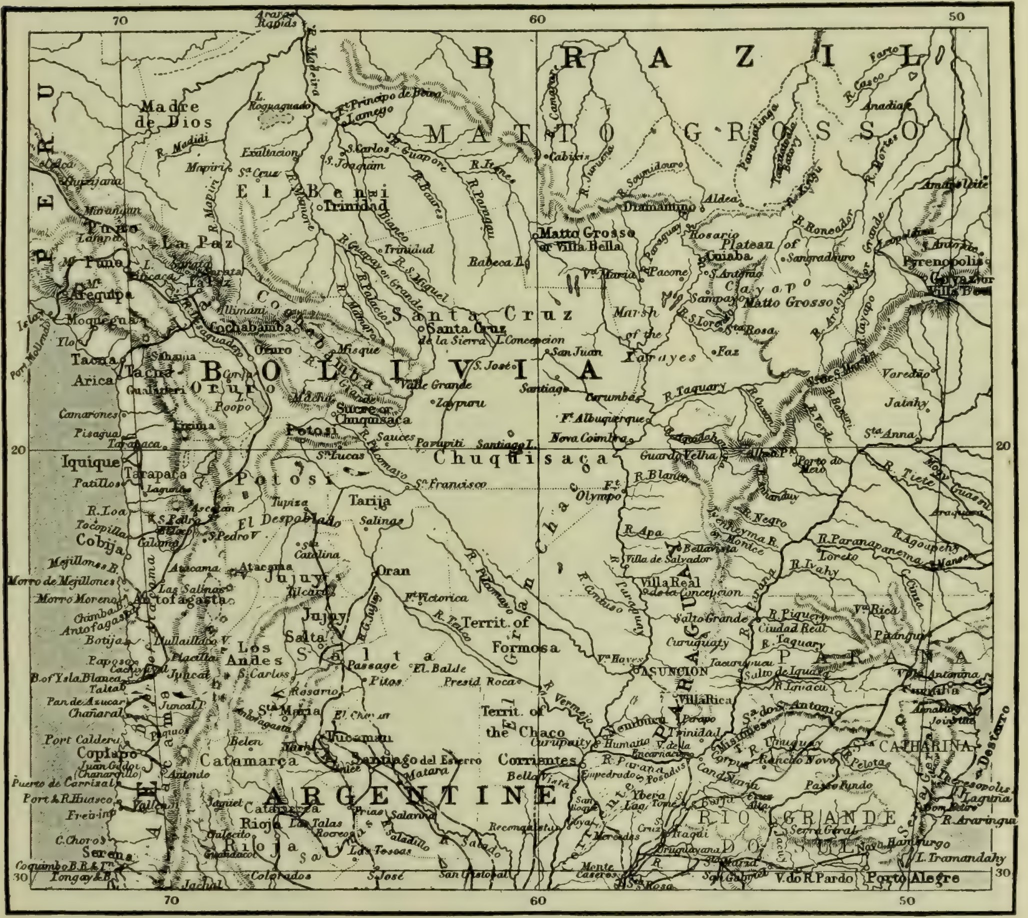
In 1812 Bolivar joined the insurgents in New Granada, and driving the Spaniards back beyond the Magdalena, recrossed the frontier with a force of 500 men, and issued his famous proclamation of war to the death. His army increased with each victory, and in 1813 he entered Carácas, where he was hailed as liberator of his country, and made dictator of Western Venezuela. Fortune deserted the patriots, however; they were routed near Cura, with great losses, and Bolivar retired to Cartagena. After further service in New Granada he went to Kingston, Jamaica, in May, 1814, where an assassin hired by the Spaniards killed his secretary by mistake.

Having visited Haiti, and assembled there the insurgent refugees, Bolivar returned to Venezuela in 1816, setting up a provisional government in Barcelona. The two years following were marked by a series of conflicts in which the scattered parties of patriots were defeated frequently. In 1819 a congress was opened at Angostura, and Bolivar, confirmed in the supreme power, reorganized his troops. Having conducted them over the Cordilleras to New Granada, he entered Tunja, won the victory of Boyacá, and soon afterward declared New Granada united with Venezuela as a republic, under the name of Colombia. But the dissensions of the patriots prevented any concerted action, and it was only in June, 1821, that the victory of Carabobo virtually ended the war in Venezuela; while it was not till July, 1824, that the royalist troops were finally driven out of the country. The constitution of Colombia was adopted on Aug. 30, 1821, with Bolivar as president.

In 1822, after the decisive battle of Pichincha, Bolivar added Ecuador to the republic, and was summoned to help the Peruvians. He was named dictator of Peru, from which the Spaniards were driven, after more than two years' hard fighting. In 1825 Bolivar visited Upper Peru, the name of which was changed in his honor to Bolivia. A constitution prepared by him in 1826 excited alarm, chiefly on account of its proposal to intrust the executive power to a president for life, with power to name his successor. In September he turned over the government of Peru to a council appointed by himself, and returned to quell a disturbance in Venezuela. His personal influence prevailed, and he was reelected president; but meantime, his famous code had been renounced in Peru, and the Colombian troops had been expelled from Bolivia. His assumption of supreme power in August, 1828, roused the apprehension of the republicans; and the dread of a second Napoleon led to another conspiracy against his life, from which he escaped by dropping from a window and seeking a hiding place beneath a bridge. In November, 1829, Venezuela separated from Colombia, and Bolivar laid down his authority and retired to Cartagena. He died at San Pedro, near Santa Marta.

Bolivar has been designated the 'Washington of South America.' The difficulties of the war of liberation compelled him to assume a dictator's power, but he was sincere in his devotion to liberty; and in the service of his country he gained no wealth, but freely spent his own fortune. Consult Ducoudray-Holstein's *Mémoires* (Eng. trans.); Rojas' *Life,* in Spanish; De Schrijver's *Esquisse de la Vie de S. Bolivar;* Petre's *Bolivar* (1910).

Boliv'ia, a republic of South America, lies approximately between latitudes 9° 44′ and 22° 50′ s., and longitudes 58° and 70° w., and is bounded on the east and north by Brazil, on the west by Peru and Chile, and on the south by the Argentine Republic. Area, 708,195 square miles.



Bolivia.

Topography.—The southwestern part is high and mountainous; the northern and eastern part is made up of low terraces sinking into lowland plains. The mountain system consists of two ranges, the Andes on the west and the Cordillera Real on the east. Between them is the great Bolivian plateau, from 70 to 80 miles in width and over 500 miles long, embracing about 40,000 square miles, at an average elevation of 12,000 feet. The highest peaks of the Andes are Huallatira (21,654 feet) and Sajahma (21,047 feet); of the Cordillera Real, Illampu (24,900 feet) and Sorata or Illimani (24,600 feet). The lowlands or *llanos* toward the north, east, and southeast constitute two-thirds of the total area.

The rivers of the north empty into the Amazon. Chief among them are the Beni, Mamoré, and Madre de Dios, which unite to form the Madeira, the largest tributary of the Amazon. From the southern section the rivers flow into the Paraguay and the Plata. On the western plateau a few short rivers lose themselves in the soil, or flow into one of the two great lakes, Titicaca (q. v.—3,220 sq. m.) and Poopo (939 sq. m.).

Climate.—The mean annual temperature of the lowlands is 74° F.; of the zone from 2,000 feet to 8,000 feet elevation, 63°; on the high plateaus, 50°. The rainy season is from December to May. On the eastern plains the rainfall is heavy, 74 to 76 inches annually; on the plateaus it is about 24 inches.

Flora.—Nearly three-fourths of Bolivia is covered with forests containing much valuable timber—mahogany, rosewood, cedar, jacaranda, quebracho and other tanning woods, copal and other gum trees, and several dyewoods. Rubber trees are found in large numbers along the rivers; and the cinchona, coca, cinnamon tree, sarsaparilla, and vanilla grow wild in abundance. Below the altitude of 6,500 feet the mimosa and bamboo flourish. The high plateau is treeless, vegetation comprising coarse grasses.

Fauna.—The wild animal life includes several kinds of monkeys, the guanaco, llama, alpaca, vicuna, puma, jaguar, wildcat, coati, tapir, and sloth. The viscacha, fox, chinchilla, South American otter, and opossum are among the fur-bearing animals. The spectacled bear, deer, antbear, capybara, armadillo, skunk, and ferret are also found. Alligators, lizards, turtles, rattlesnakes, and boa constrictors are plentiful in the lowland country. Among the larger birds are the condor and stork; water fowl of all kinds are abundant. There are large herds of wild cattle roaming the plains, and wild hogs in the forest lands.

Mining.—Bolivia is extremely rich in minerals. Among the metals are tin, silver, gold, copper, iron, lead, zinc, cobalt, platinum, antimony, bismuth, and quicksilver; among the nonmetals, alum, arsenic, borax, talc, mica, marble, salt, saltpetre, asphalt, and petroleum. Precious stones include the topaz, turquoise, amethyst, and lapis lazuli. Tin is mined principally in the neighborhood of La Paz and Oruro. The principal mineral exports in 1915 were: tin, $19,814,000; antimony, $4,835,000; copper, $3,929,000.

The silver mines are extremely rich, but are not now worked extensively. The Spaniards, from 1556 to 1651, took $3,000,000,000 in silver from the famous mines at Potosí. Nearly every stream coming down from the Andes carries gold, and it has been found also in the rivers flowing into the Amazon. The gold produced between 1540 and 1900 was valued at $2,225,000,000. Copper exists in large deposits.

Agriculture is carried on chiefly in the eastern valleys of the Cordilleras. Coffee, cocoa, sugar cane, tobacco, cotton, rice, yucca, manioc, maize, and alfalfa are cultivated; pineapples, oranges, bananas, lemons, peaches, pears, apples and cherries are produced; and there are extensive plantations of cinchona, coca, and other medicinal plants.

Vast stretches of grazing land are devoted to the raising of sheep and goats, also of tame alpacas, llamas, and guanacos, used as beasts of burden as well as for their wool. On the llanos of the north and the pampas of the southeast large herds of cattle are pastured.

Transportation.—Bolivia has about 800 miles of railroad in actual operation, and 1,800 additional miles under construction or projected. The principal line runs from the Chilean port of Antofagasta to Oruro, to Viacha, to La Paz (719 miles). The Arica–La Paz Railroad, opened in 1912, gives a third outlet to the sea—the other being *viâ* Lake Titicaca to the Peruvian port of Mollendo. The projected Pan-American Railroad is planned to run from Guaquin to Viacha and thence to the Argentine border *viâ* Uyuni, Tupiza, and La Quiaca.

The navigable streams cover 5,625 miles, and all flow toward the Atlantic by way of the Amazon in the north and the Plata in the south. Large steamers ply on Lake Titicaca, trans-shipping freight to Mollendo. There are about 3,800 miles of telegraph line, connecting the principal cities.

Commerce.—Bolivia has no seaport of its own, but depends on Antofagasta, Arica, Mollendo, and certain river ports. The exports for 1915 were valued at $33,960,000; the imports, $7,893,000. The latter have fallen off greatly since the war. The chief exports are rubber, tin, and silver; the chief imports, cottons, woollens, cattle, provisions, and machinery.

The ***population*** in 1915 was placed at 2,890,000, of which about 50 per cent. are Indian, 25 per cent. mixed Spanish and Indian, and 13 per cent. white. The principal towns are: La Paz (pop. 100,000), Cochabamba (31,000), Potosi (30,000), Sucré, the capital (30,000), Oruro (22,500).

Primary ***education*** is nominally free and compulsory, and there are over 900 elementary schools. Secondary education is provided by 21 colleges and 5 clerical institutes. For higher education there are 19 institutions with 1,500 students. There are universities at Sucré and La Paz, with schools of law, medicine, and theology; and commercial, military, and normal colleges at La Paz.

The Roman Catholic religion is supported by the state, though other forms of worship are tolerated. The church is governed by an archbishop resident at Sucré. The non-Catholic population numbers less than 50,000.

Military service is compulsory for men between 20 and 50 years of age. The peace strength is about 3,000, with a militia and reserve force of approximately 100,000.

Government.—Bolivia is governed by a president elected for four years, a Senate elected for six years, and a Chamber of Deputies elected for four years—all by direct popular vote. There are two vice-presidents, and a Cabinet of six ministers appointed by the president. Suffrage is granted to all male citizens over twenty-one years of age who can read and write, and who have a fixed independent income. The country is divided into 8 departments, 3 territories, and 61 provinces.

History.—For two centuries after the Spanish conquest the country formed part of Peru (q. v.). Bolivia proclaimed its independence in 1825, after the overthrow of the Spanish power at Ayacucho (1824). The first constitution was drawn up by Gen. Simon Bolivar (q. v.), and adopted in 1826; the first president was General Sucré. During the succeeding years, Bolivia suffered frequently from civil wars.

In 1879–84 Chile waged successful war against Bolivia allied with Peru, and deprived Bolivia of the coast province of Atacama, with its valuable nitrate and guano deposits.

The boundary dispute with Brazil as to the territory of Acré was settled in November, 1903, when, in return for Upper Acré, Upper Purus, and Upper Jurua as far as 11° s. (73,720 square miles), Bolivia acquired territory on the frontier of Matto Grosso and the River Madeira (1,221 square miles), together with a money payment of $10,000,000 and commercial facilities.

On April 13, 1917, Bolivia severed diplomatic relations with Germany.

Bibliography.—Consult Pan-American Bureau's *Bolivia;* Blanco's *Diccionario Geográfico de Bolivia;* Marie Wright's *Bolivia* (1907); Peixotto's *Pacific Shores from Panama* (1913); Walle's *Bolivia* (Eng. trans. 1915).

Bolkhov, bol-kof', city, Orel government, Russia; 37 miles north of Orel. It manufactures leather, gloves, hosiery, and soap. Pop. 22,000.

Boll, the rounded pod or capsule of such plants as flax and cotton (qq. v.).

Bol'landists, an association of Jesuits by whom the *Acta Sanctorum,* or Lives of the Saints of the Christian Church, were collected and published (1643–1794). They received their name from JOHN BOLLAND (1596–1665), born in the Netherlands, who edited the first five volumes at Antwerp, and associated young men of his order with him in the work. The suppression of the Jesuit order in 1773 caused the removal of the Bollandist Society to Brussels, till the persecutions under Joseph II. brought about its dissolution. In 1789 the Abbey of Tongerloo in Brabant took up the task; but scarcely had the fifty-third volume appeared in May, 1794, when the French occupation, with the destruction of the MS. collections, put an end to the work.

In 1837 a new Bollandist association of Jesuits was formed under the patronage of the Belgian government. Sixty-five volumes, most of which contain more than a thousand closely printed pages in double columns, have appeared, with an index (1892). The calendar from January to October has been covered.

Bollene, town, Vaucluse department, France; 25 miles north of Avignon. It has silk industries. Pop. (1911) 6,069.

Bolles, bōlz, ALBERT SYDNEY (1846), American economist, was born in Montville, Conn. After being admitted to the Connecticut bar, he became a judge of probate for Norwich (1870); professor of mercantile law and banking at the Wharton School of Finance and Economy; chief of the Bureau of Industrial Statistics; and lecturer on law at Haverford College. He has written: *Banking; Industrial History of the United States; The History of Pennsylvania; The Modern Law of Banking; The Conflict between Labor and Capital; Money, Banking, and Finance.*

Bolley, HENRY LUKE (1865), American plant pathologist, was born in Manchester, Ind. He was graduated from Purdue University (1888; M.S. 1889); was instructor and assistant in biology at Purdue and assistant botanist at the Indiana Agricultural Experiment Station (1889–90); and in 1890 became professor of botany and zoology at North Dakota Agricultural College (dean of division of biology since 1909), and botanist and plant pathologist of the Government Experiment Station for North Dakota. He made a special study of plant diseases; discovered the parasitic nature of potato scab, and originated preventive measures to combat that disease; first employed formaldehyde as a disinfectant for seed grain; discovered the cause of so-called flax-sick and wheat-sick soil, and made other discoveries of importance in economic agriculture.

Bollington, town, East Cheshire, England; 2 miles northeast of Macclesfield. It has cotton manufactures and calico printing. Pop. (1911) 5,225.

Boll Rot. See COTTON: *Diseases.*

Boll Weevil, bōl wē′vil, a small grey weevil (*Anthonomus grandis*), about the size of the common housefly, which is the most serious pest of cotton in the United States. The adult weevils puncture the young flower buds and deposit eggs. As grubs from the eggs develop, the buds drop. They also lay eggs later in the year in the young bolls, and when the grubs develop the cotton is ruined. The boll weevil first entered the United States, from Mexico into Southwestern Texas, in 1892. In one year the damage done by the weevil has been estimated at more than $10,000,000; it has caused a loss in the production of cotton in the United States in excess of 10,000,000 bales; while the loss due to the reduction in cotton planting cannot be estimated.

So far all attempts to destroy the weevil by spraying or poisoning have met with scant success, primarily for the reason that the weevil bores into the plant for his food, while sprays and poisons lie upon the surface. Burning or ploughing under the infested cotton plants in the fall, burning all brush heaps, picking and destroying weevils which appear upon the young cotton, picking and destroying the infested squares during the growing season, rotating crops so that the weevils find no cotton to feed upon when they emerge from their hibernating quarters, are among the remedies which experience has shown to be the most effective. However, the main reliance of the planter still continues to be in sunshine and hot, dry weather, and he also relies upon the assistance of predaceous insects and birds that prey upon the boll weevil. See WEEVIL; COTTON. Consult *Bulletins* of the U. S. Department of Agriculture.

Bollworm, a caterpillar (*Heliothis obsoleta* or *armiger*), which bores into flower buds and young bolls, causing them to drop. The bollworm is most destructive in the Southwestern United States, where the annual loss is estimated at $12,500,000. Paris green kills the worm in its young stages. (See COTTON, *Diseases.*)

In 1916 the Department of Agriculture announced that the PINK BOLLWORM, the most destructive cotton pest known, had appeared for the first time in North America. It was discovered in Northern Mexico, and importation of cottonseed, cottonseed hulls, and seed cotton from Mexico was prohibited.

Bolo, a large steel knife with a thick blade, used by the natives of the Philippine Islands both as a tool and a weapon.

Bologna, bō-lō′nyä, province, Italy, lying between the middle Apennines and the lower Po. To the south of Via Æmilia, on which stands the capital Bologna, are the slopes and valleys of the Apennines, and north of it is the fertile, well-watered valley of the Po. Wheat and maize are largely grown. Its principal manufactures and industries are those of the city of Bologna (q.v.). Area, 1,448 square miles. Pop. (1901) 527,367; (1911) 577,969.

Bologna (ancient *Bononia*), city, capital of the province of Bologna, Italy, and an archiepiscopal see, situated at the foot of the Apennines; 135 miles southeast of Milan by rail, and 82 miles north of Florence. All the railways of that part of Italy converge on Bologna. It is one of the ancient cities of Italy, beautifully situated on a fertile plain at the foot of the lower slopes of the Apennines. It stands on the ancient Via Æmilia, and in a fortified strategical position.

The streets in the newer parts of the city are spacious and well paved; the older central parts are adorned with many fine palaces of the nobility, rich in fresco paintings by the great masters. Pre-eminent are the Palazzo Publico and the Palazzo del Podestà. The former contains some fine frescoed rooms and galleries; the latter is interesting as having been the prison and death scene, in 1272, of Enzio, the son of the Emperor Frederick II.; it also contains the archives of the city.

The religious edifices are remarkable for the beauty of their architecture and for the abundance and splendor of the art treasures they contain. Bologna has more than seventy churches, the most remarkable of which are San Stefano, rich in relics, Madonnas, and Byzantine frescoes of the eleventh and twelfth centuries; San Petronio (1390–1659), which, though unfinished, is the largest church in the city, a noble specimen of Italian Gothic, with a meridian traced on the floor by the astronomer Cassini, and numerous masterpieces in sculpture and in painting; San Domenico, where the founder of the order lived and died, and where his tomb has been richly ornamented by Michelangelo and others; and the Cathedral of St. Peter (founded in 910, rebuilt in 1605), rich in works of art. In the centre of the city are two remarkable leaning towers—Torre Asinelli and Torre Garisenda (see CAMPANILE), belonging to the twelfth century. Outside the city stand the Certosa (1335) and the pilgrimage Church of the Madonna of St. Luke.

The ***University of Bologna,*** the oldest in Europe, claims to have been founded in 425; it certainly dates as a law school from the eleventh century. Its reputation early became so great, chiefly on account of its school of jurisprudence, that students from all parts of Europe were attracted to it. In 1262 the number receiving instruction is stated to have been 10,000. The students now number 1,600, and the University holds a first rank among Italian educational institutions. The *Academy of Fine Arts* is particularly rich in the works of those native artists who founded the far-famed Bolognese School of Painting—Guido Reni, Domenichino, Francesco Albani, the Carracci, and Guercino (qq. v.)—and it has also some fine specimens of other schools.

Bologna is the birthplace of the painters already named, and of Francia, Galvani, and Rossini. It has given eight popes and more than 200 cardinals to the Church.

The surrounding district is fertile. Trade and manufactures are important, the principal products being hams, sausages, perfumery, soap, lace, artificial flowers, macaroni, liqueurs, preserved fruits, silks, cloth, hemp textiles, glass, tobacco, and hats. Pop. (1901) 147,898; (1911) 172,639; (est. 1915) 189,770.

History.—Bologna owes its origin, which is said to be much more remote than that of Rome, to the Etruscans, by whom it was called *Felsina*. It was afterward, as *Bononia*, the chief town of the Boii, from whom it was taken by the Romans and made a colony (189 B. C.). After the fall of the Roman Empire it passed into the hands of the Longobards, from whom it was taken by the Franks. The feuds of the Guelph and Ghibelline factions led in 1506 to the downfall of the republic, and the supremacy of the Papal See. In 1796 Bologna was taken by the French, and was constituted the chief town of the Cisalpine Republic; in 1815 it reverted to the Pope. From the commencement of the Italian campaign of 1859, the Bolognese gave an active sympathy to the national cause; and in 1860 the city became part of the modern kingdom of Italy. Consult Coulson-James' *Bologna* (1909).

Bologna, GIOVANNI or GIAN (1524–1608), sculptor of the Italian renaissance, called IL FIAMMINGO, from his birthplace in Flanders. He went early (1551) to Florence to study the work of his contemporary Michelangelo, and worked there for three years under the goldsmith Vecchietti. His statues are characterized by classic simplicity and nobility of form; the chief are the bronze *Mercury*, in the Bargello at Florence; the *Rape of the Sabines*, in the Loggia dei Lanzi at Florence; and the equestrian statue of Cosimo I. (1594), grand duke of Florence. He also designed the fountain of Neptune at Bologna, and the bronze gates for the Pisa Cathedral (1595).

Bologna University. See BOLOGNA.

Bolom′eter ('ray measure'), an instrument invented by S. P. Langley (q. v.) for the measurement of radiant heat. The principle of its construction is the change of electrical resistance which is produced in metallic conductors by variations of temperature. In Langley's improved apparatus, erected at the Smithsonian Astrophysical Observatory in 1892, all the movements are automatic. The sun's rays collected by a large siderostat, are transmitted through a rock-salt prism, and the infra-red part of the spectrum thus formed is made to travel by means of clockwork in front of a bolometric strip one-twentieth of a millimetre wide and one-thousandth of a millimetre thick. The ensuing electrical effects record themselves through the movements of a speck of light which is thrown from a mirror attached to the galvanometer upon sensitized paper shifted at a steady rate.

The curves traced as the outcome of the process are termed *bolographs;* they show, by their heights and hollows, the alternations of temperature due to absorption. From the materials furnished by them Langley mapped about 750 lines below the red, mostly of telluric origin. His perfected bolometer records differences of temperature not exceeding one ten-millionth of a degree centigrade. See ACTINOMETER.

Bolondron, bō′lōn-drōn′, town, Matanzas province, Cuba; 35 miles southeast of Matanzas city. Pop. 15,000.

Bolor-tagh, bō-lôr′ täg′, a mountain range of Central Asia, reaching altitudes of 24,000 to 26,000 feet. See PAMIRS.

Bolsena Lake of, bōl-sā′na, about 55 miles northwest of Rome, in the centre of a volcanic district. It is 1,000 feet above sea level, 480 feet deep, 10 miles long, and 8 miles broad.

The town of ***Bolsena*** stands on the northwest shore of the lake, 9 miles southwest of Orvieto (q.v.). It has remains of the ancient *Volsinii Novi*.

Bolsheviki. See BOLSHEVISM.

Bolshevism (derived from *Bolshevik*, pronounced bol-she-vĕk′; plural *Bolsheviki*, pronounced bol-she-vē-kē′), a term loosely used to denote: (1) the communist party now in supreme control of what remains of the Russian Empire; (2) the Russian Socialist Federal Soviet Republic; (3) a proposed international world-order to consist of a loose federation of national soviet republics under the control of the workers of the world; (4) any party or movement having the same general aims of conquest of absolute political power by armed revolution of the propertyless working class.

The word, meaning *majority*, was originated in 1903 to designate the *majority* of the Russian Social Democratic Labor Party. During the great revolutionary ferment of 1903–5 a profound cleavage, both as to the ideals and methods of attainment of the Socialist state, developed between the two factions of the party, and the Bolsheviki, no longer the majority faction, became the radical left wing, sharply differentiated from the great majority of Social Democrats in their program. They sought: (1) The early attainment of socialism, not by evolution but by a *coup d'état* of 'an armed and desperate proletariat'; (2) non-participation in any democratic government or duma beyond the appropriation of the duma platform for socialist propaganda, and no co-operation with other socialist or democratic groups in the duma in problems of actual government; (3) formation of a strong centralized party organization to control the coming revolution; (4) constant propaganda among the workingmen, inciting them to armed revolt against the Czar's government.

Russia was on the verge of a great anti-Czar revolution, when the Great War broke out in August, 1914. With other Russian socialist groups, the Bolsheviki joined in a peace manifesto, branding the war as a crime against the internationale, and refused to vote war credits. The majority of the socialists soon rallied to the patriotic defence of the fatherland. Not so the Bolsheviki. Defeat, even more than a Russian victory, might bring the opportunity for the sudden *coup d'état*. Accordingly, they continued to plan a revolution and initiated a vicious propaganda among the soldiers 'that their weapons should be directed not against their brothers, the hired slaves of other countries, but against the reactionary bourgeois governments.' The government suspected the plot and arrested the leaders, at a Revolutionary conference at Viborg on Nov. 17, 1914. From this time on until after the overthrow of the Czar and the establishment of a provisional government, the Bolsheviki played small part in the history of Russia, their *rôle*, under the brilliant and unscrupulous leadership of Nicholai Lenine, whose real name is Vladamir Oulianov, being limited to seditious propaganda and association with German agents in attempts to sabotage the government of the Czar.

The eventual overthrow of the Czar on March 16, 1917 (see RUSSIA), was effected by two forces, the patriotic group in the duma, and the revolutionary force of soldiers and workmen, soon afterward organized into soviets or revolutionary councils. The duma group at first assumed complete political power, although the actual strength of the movement lay in the soldiers of the great garrison city, supported by the radical workmen. The soldiers at the front and the sailors of the fleet represented a third group, while a fourth group, powerful, though largely unorganized and remote from the political centres of activity consisted of the peasants, forming 85 per cent. of the population, and demanding now, as in every crisis of Russian affairs, 'land for the people.'

A constituent assembly to form a permanent form of government was early determined upon by the provisional government. The task of establishing the electoral machinery for a first election on the principle of universal and secret suffrage in a country so huge, so heterogeneous, and so lacking in transport system, however, was immense, and it was found necessary to postpone the date of the election from Sept. 30, to Nov. 25, 1917, though every effort was made to organize a permanent constitutional government at the earliest possible date.

The insurrection of General Korniloff gave the Bolsheviki the opportunity they sought. On Sept. 3, Riga was shamefully surrendered to the Germans, and panic reigned in Petrograd. Korniloff charged Kerensky with collusion with the German general staff under pressure from the Bolsheviki. Kerensky ordered Korniloff's removal, but the General replied by dispatching troops from the front to seize the government at Petrograd.

Now, however, the Bolsheviki raised the cry of counter revolution. The Revolution must be saved from the agents of the Czar. Korniloff to them was the old hated *régime*. The Korniloff forces melted away before Petrograd was reached, but the battle cry 'save the revolution' was turned against the Kerensky government. The provisional government was charged with being the enemy of the Russian people because it had delayed calling the constitutional convention and because it had not given the land to the peasants. A revolution was openly called for, and revolutionary troops (Red Guard) were formed from deserters from the army. A new All-Russian Congress of Soviets had been elected to meet Nov. 7, in which for the first time the Bolsheviki, not without suspicion of intimidation and fraud, had secured a majority. On the night of Nov. 6 the Bolshevik coup took place, and on the seventh most of the members of the government were arrested. Kerensky escaped. Little blood was shed.

A new government was formed under an executive committee called the Council of Peoples' Commissars with Nicolai Lenine as President and Leon Trotzky Commissioner of Foreign Affairs. Lenine was dictator of Russia in the name of the proletariat, and by virtue of the power of the Red Guards. Thus the Russian Socialist Federal Soviet Republic was born.

The constituent convention was generally looked forward to as the salvation of Russia. It was one of the chief issues on which the Bolsheviki gained control. The election of delegates had been set for Nov. 25. One of the first decrees of the Peoples commissars was to confirm the date and order 'fair play at the elections.' The Bolsheviki, in spite of every effort, elected only a minority of the delegates, and forthwith, contrary to their public declaration to hold power only until the convening of the constitutional convention, began to plot its overthrow. Efforts were made to intimidate the early arrivals; delegates were arrested and some were shot. One hundred persons were killed or severely wounded by the Red Guards in the attempt to break up the processions and demonstrations in favor of the convention. When the convention finally met, Jan. 18, 1918, Sverdlov, for the Bolsheviki, presented a 'declaration of rights of the toiling and exploited peoples,' outlining a framework of soviet government, and limiting the power of the convention to the adoption of this plan. While approving the principle of the nationalization of land, mines, forests, and waterways, the convention refused to abdicate to the soviet committee and repudiated the idea of a separate peace with Germany, while favoring the continuance of the armistice. Thereupon the convention was dispersed by the Red Guard sailors from the Baltic fleet. The All-Russian Peasant Congress which met a few days later and supported the Constitutional Convention was similarly dispersed by armed force.

The Lenine-Trotzky Ministry had summoned an extraordinary Congress of Soviets to meet in Petrograd at the same time. This congress approved the declaration of rights, spurned by the constitutional convention, and thus established a permanent soviet government. This provisional constitution was later revised, elaborated, and adopted by the fifth Soviet Congress on July 10, 1918, as the permanent Constitution of Russia.

In the meantime negotiations for peace had been undertaken by Trotzky. An armistice had been signed and negotiations opened at Brest-Litovsk (q. v.) Dec. 22, 1917. Trotzky indignantly repudiated the infamous German peace terms, and counseled resistance by a new Red Army. He was overruled by the practical Lenine, and the peace terms were formally, if sullenly, accepted by the fourth Soviet Congress.

The history of Russia from this date has been a tragic tale of civil and foreign war. Isolated from the world by an iron ring of self-made enemies, little is known of the details of the economic anarchy and terror that reign within. The self-confessed enemy of all democratic government, the Soviet Republic is described by Lenine himself as the dictatorship of 200,000 members of the Bolshevik party over 50,000,000 Russians.

The economic structure of Russia had broken down even under the Czar's *régime*. The provisional government, with such aid as the Allies could give, was unable to re-establish industry. Under the socialistic experiments of the Bolsheviki, the very elements of economic life seem to have been destroyed. Industry is dead. Transport is almost non-existent. Credit, finance, and business have been reduced to mere barter of commodities.

The strength of the Bolsheviki as an organized government lies largely in its use of the native institution, the soviet, which originated as a revolutionary committee of workmen in 1905. Soviets are of many kinds from the simple 'town-meeting' of the peasants, and the industrial 'union' or 'guild' of the factory to the great national assembly of delegates from all local, provincial, and industrial soviets. The village or factory group is the unit. Central soviets of delegates from local soviets are formed in all townships, districts, provinces, and the national soviet of delegates is called together at least twice a year to exercise supreme legislative power. All delegates are at all times responsible to the group from which they are elected and can be recalled at any time. Executive committees hold the supreme power when soviets are not in session. All soviets are responsible for the enforcement of the *general* laws as well as local ordinances and decrees. This plan of representative government is vitiated by limitations of franchise and inequalities of representation. Only the poorest peasants and the propertyless workers are permitted to vote. The following classes are disenfranchised: (*a*) All employers of labor including servants. (*b*) All capitalists, or others receiving interest, rent, dividends, or an income from financial or industrial enterprises. (*c*) All merchants, traders, and dealers. (*d*) All clergymen and priests, and employees of religious bodies. (*e*) Certain former officials of the Czar's government, criminals, and insane. The professional class (intelligentsia) and those engaged in the management of industry are usually permitted to vote, if not 'counter-revolutionary' or otherwise disqualified.

The Bolshevik revolution was frankly an economic overthrow of the capitalist system. Capitalists, 'bourgeoise,' are represented as the real enemies of the people. No mercy, no justice, no compensation is allowed them. Private property was in general promptly confiscated to the state on a large plan. Homes and small personal belongings are alone exempt. Land was nationalized and became the property of the state, as did also all live stock, all agricultural implements, all forests, mines, minerals, and natural resources, all banks and banking institutions, all factories, mills and industrial institutions, all church property, all public meeting places and assembly halls. Insurance has been made a state monopoly as has also the transportation business, the publishing of newspapers, periodicals, and (largely) books, all advertising, all foreign trade. Compulsory labor has been made universal, as has also compulsory military service. All foreign debts and all debts due landlords and capitalists were repudiated. The right of inheritance was abolished and all estates of all decedents confiscated. The right to manage and operate factories is vested in the workers, the right to divide and cultivate the land and enjoy the fruits thereof is vested in the peasants. The right to employ any human being in any capacity is annulled. Co-operative production and co-operative agriculture are permitted. Rights of assembly and free speech are abridged. Revolutionary tribunals vested with unlimited power of arrest, trial, pronouncing and executing sentence make a travesty of justice.

The war-born Russian soviet republic is recognized by Lenine and the communists (as the Bolsheviki are officially called) as a transitional incomplete Socialist state. The ideal aim of the party is stated in the familiar terms of a communist utopia. 'The complete liberation of the laboring classes from spoliation and oppression' is represented as an international problem, to be accomplished only through the united exertions of workmen of all lands. The Soviet Republic urges the establishment of local soviets as centres of world revolution wherever possible, and extends to all such organizations an invitation to 'enter as members with equal rights into the fraternal family of the Republic of Soviets. . . . to any extent in whatever form they might wish.' This is plainly a veiled invitation to universal revolution, and a covert threat against all organized governments. Local soviets such as exist in most European and American countries are in fact not so much private associations of citizens, as weak members of a Soviet World League under Russian hegemony. The doctrine of class selfishness as a natural and unavoidable basis of human government has challenged the democratic faith in the equality and inherent rights of all men, regardless of class or economic status.

Bol′sover, town, Derbyshire, England; 6 miles east of Chesterfield. It has coal mines and limestone quarries. Pop. (1911) 11,225.

Bolsward, bōl′svärt, town, province of Friesland, Holland; 6½ miles northwest of Sneek. It has a fine town hall in the renaissance style (1614–18), the church of St. Martin (1446–66), and the so-called Small Church (1280). There is trade in agricultural produce; pottery, tiles, and textiles are manufactured. Pop. (1910) 7,215.

Bolt, any metal pin which unites parts of structures or machines. Temporary bolts are fixed to doors, windows, etc., and are operated by a key or the hand. Permanent bolts take various shapes, according to their use; they may be round, square, hook-and-eye, etc. The commonest form of bolt has a head and a screw thread toward the end, and is fastened up with a loose nut.

In shipbuilding, bolts which completely penetrate a structure are *through* bolts, and those which only partly do so are *blunt* bolts. *Eyebolts* have a hole in the projecting end; a ring through this hole turns the eyebolt into a *ring bolt.* The *Lewis bolt* is an eyebolt with a barbed shank fixed into a socket on the deck.

The word is used in firearms for the part of a rifle which sends the firing pin home, and also for an elongated bullet.

Bolting Cloth. See GAUZE.

Bol′ton, or BOLTON - LE - MOORS, town, Lancashire, England, on the River Croal, which divides the town into Great and Little Bolton; 11 miles northwest of Manchester by rail. The principal buildings are the Public Library, the Town Hall (1873), the Technical School, and the Mechanics' Institute. It is one of the chief centres of the cotton industry, and is noted for fine yarns. There are also manufactures of muslins and fine calicoes, foundries, iron works, bleaching, paper, and saw mills, and chemical works. In the vicinity are extensive coal fields. The town operates its street railways, gas and electric works, and markets.

As early as 1337 the Flemings introduced the woollen trade into Bolton; this was further stimulated by French Huguenots in 1685. The inventions of Arkwright and Crompton, who were natives of the town, played an important part in its development. Pop. (1901) 168,205; (1911) 180,885.

Bolton, CHARLES KNOWLES (1867), American author and librarian, was born in Cleveland, Ohio. He was graduated from Harvard (1890), and was successively assistant in the Harvard Library (1890–93), librarian of the Brookline library (1894–8), and librarian of the Boston Athenæum library (1898–). He served also as instructor and associate professor at Simmons College, and as a trustee of the Boston Museum of Fine Arts. He edited *Letters of Hugh, Earl Percy* (1902) and the *Athenæum Centenary* (1907), and wrote: *Saskia, the Wife of Rembrandt* (1893); *On the Wooing of Martha Pitkin* (1894); *The Love Story of Ursula Wolcott* (1895); *Brookline, History of a Favored Town* (1897); *The Private Soldier under Washington* (1902); *Scotch-Irish Pioneers* (1910); *American Library History* (1911); *The Elizabeth Whitman Mystery* (1912); *Christ Church, 1723* (1913); *Portraits of the Founders* (1919).

Bolton, HERBERT EUGENE (1870), American educator and historian, was born in Wilton, Wis. He was graduated from the University of Wisconsin (1895) and from the University of Pennsylvania (PH.D. 1899); was professor of history and economics in the Milwaukee State Normal School (1899–1901); instructor (1901–05), adjunct professor (1905–08), and associate professor (1908–09) of history in the University of Texas; and professor of American history at Leland Stanford Jr. University (1909–11) and at the University of California (1911–). He is known for his researches in the Mexican archives on the history of Spanish America, and of the Southwestern Indians. He published *Guide to Materials for U. S. History in the Archives of Mexico* (1913); *Athanase de Mézières* (1914); and *Texas in the Middle Eighteenth Century* (1915). He edited *With the Makers of Texas* (1904), *Spanish Explorations in the Southwest 1542–1710* (1915), and *Father Kino's Memoirs* (2 vols., 1919).

Bolton Abbey, township, England, in West Riding, Yorkshire, on the River Wharfe; 6 miles east of Skipton. A priory for Augustinian canons, founded at Embsay about 1121, was moved here in 1151. It is now a picturesque ruin whose nave serves as a parish church.

Bo'lus, a soft mass of any kind of medicine, intended to be swallowed at once. It is similar to a pill but is larger.

Bo'ma, or M'BOMA, formerly known as EMBOMMA or LOMBI, city, former capital of the Belgian Congo, West Africa, on the right bank of the Congo River; 55 miles from its mouth. The harbor, formed by the Congo and the island of Nkete, is about a mile wide and from 20 to 66 feet deep. Boma was established in the sixteenth century as a station for European traders, and became a well known slave mart. Pop. 6,000.

Bomarsund, bō'mär-sŏŏnd', ancient Russian fortress on the east coast of Aland Island, Baltic Sea, at the entrance to the Gulf of Bothnia. On Aug. 16, 1854, after a six days' siege, it was taken by the allied fleets of Britain and France. Russia, by the Treaty of Paris, was forbidden to rebuild it.

Bomb, BOMB SHELL, a hollow projectile, usually of cast iron, fired from a piece of ordnance. It is fitted with a time fuse, which causes it to burst at any required instant. The fragments are most destructive, and the flame of the explosion sets fire to anything inflammable with which it comes in contact. Such projectiles were formerly fired from mortars only; but all modern pieces of artillery now use them. See AMMUNITION; EXPLOSIVES; GUNS.

Bomb, in geology, a large, round, porous mass of igneous rock often mixed with other varieties of volcanic ash and ejected by active volcanoes. The blocks are often pear shaped or flattened, owing to their having been in rapid rotation while hot and viscous during their journey through the air. They are simply a large form of the *lapilli* of which the ash beds principally consist. Masses nine feet in diameter have been thrown a distance of several miles. When such materials have, in course of time, been compacted into firm rock, they are known as volcanic agglomerate. Bombs are sometimes hollow, owing to the expansion of the steam in the molten igneous rock, aided, no doubt, by centrifugal force.

Bomba'la, town, New South Wales, in Wellesley County; 250 miles southwest of Sydney. Pop. of town, 1,000; of district, 4,500.

Bombard, a kind of cannon in use about the fourteenth century, sometimes capable of throwing balls of stone of 200 pounds weight.

Bombar'dier, the lowest noncommissioned officer in the British artillery, ranking with corporals in the infantry and cavalry. The name was applied in the seventeenth and eighteenth centuries to a man employed about the mortars and howitzers —ordnance used in bombarding.

Bombardier Beetle, a name given to several species of beetles belonging to the family Carabidæ. The name refers to their offensive and defensive habit, when annoyed, of discharging an acrid volatile fluid with explosive force from the abdomen. The discharge has a pungent odor, acid and caustic properties, and evaporates with effervescence in the air. The most common English species is only about a half inch long. When roughly handled, it will make more than a dozen discharges in rapid succession.

Bombardment, an attack by artillery upon a fortress or town. In modern warfare attacks from the air are often called bombardments. In modern times a bombardment is generally adopted as an adjunct to a siege, distracting the garrison by an incessant fire from mortars and heavy guns day and night. A bombardment is more frequently a naval than a military operation. History has shown that the effects of bombardment on the civil population is usually small—about one per cent. only being killed. The Brussels Conference of 1874 drew up rules for the restriction of bombardment to fortified places and towns which actively oppose the enemy. The Hague Regulations, formulated at the Hague Peace Convention, also prohibit bombardment of undefended towns or buildings, provide that warning be given the authorities of intention to attack and that all possible steps be taken to spare buildings dedicated to art, science or religion, historic monuments, and hospitals.

The stores required for a vigorous bombardment are immense. Thus, in 1759, Rodney threw 20,000 shells into Havre; in 1792 the duke of Saxe-Teschen threw 36,000 shot and shell into Lille in 140 hours; in 1795 Pichegru threw 8,000 shells into Mannheim in 16 hours; and in 1807 the English threw 11,000 shot and shell into Copenhagen in 3 days. In January, 1871, the Germans, bombarding Paris and its forts, threw 10,000 shells daily into the place, of which 500 fell in the city itself.

One of the most famous bombardments in history is that of Port Arthur during the Russo-Japanese War, August–December, 1904. Some three hundred guns were trained against the place, and all the infantry assaults were preceded by bombardments. The Japanese used regular siege guns of from 5 to 6 inches calibre, naval guns (4.7 to 6 inches), ordinary field ordnance, and, above all, 11-inch mortars weighing eight tons apiece without the carriage. During heavy bombardments each gun was fired once every eight minutes, and the grand bombardments were kept up about four hours. The mortars had a maximum range of seven or eight miles, but none of them were more than three miles distant from the town. They were fired at angles as great as 60°, 'the huge shells hurtling high into the heavens, passing over two ranges of hills, and falling like thunderbolts out of the blue sky vertically upon the devoted city.' Practically no damage was inflicted on the many large buildings, the attack being directed mainly to the defences, the storehouses, and the warships in the harbor.

In the Great War there were many bombardments from the air, for an account of which, see section *Aerial Warfare* in the article EUROPE, GREAT WAR OF. See FORTIFICATION.

Bombay, bom-bā', city, capital of the presidency of Bombay, India, is situated in 18° 55' N. and 72° 54' E., on an island of the same name, which is 11 miles long by about 3½ broad. The city is connected by causeways and breakwaters with Salsette Island and the mainland. Three main lines of railway have terminal stations in Bombay: by two of these the port is in direct communication with Calcutta, either through the Central Provinces or through Rajputana; the third line runs southeast, by way of the Nizam's Dominions, to Madras. Its harbor, studded with islands and crowded with shipping, is one of the finest in the world; the space available for shipping being about 14 miles long by 5 broad. The mails to and from the West for all India are embarked at and disembarked from this port, which is called 'the Gate of India.' For administrative purposes the city constitutes a district by itself, with an area of 22 square miles.

Bombay is the most European in appearance of all the cities of India, and is second only to Calcutta in commercial activity and population. The native town lies to the north. On Kolaba, the narrow southern extremity, is the European garrison. A shallow sheet of water on the farther side of Kolaba, called Back Bay, is encircled on the west by a hilly promontory (Malabar Hill), terraced with houses—the residential quarter, especially for Europeans. On the esplanade, facing toward Back Bay, are the Secretariat, the University, Senate Hall, High Court, Offices of Public Works, Sailors' Home, and statue of Queen Victoria. The Taj Mahal, opened in 1904, is one of the largest and best hotels in India. Opposite the anchorage are the fort and the docks and places of business. In the neighborhood of the fort are the Town Hall, Mint, Cathedral, and Custom House. The Victoria terminus of the Great Indian Peninsular Railroad, opened in 1876, is probably the finest building in Bombay. Near by a new General Post Office has been erected.

Recently Bombay has undergone considerable development. Large areas of land have been reclaimed, South Salsette Island has been developed, the harbor has been improved and its defences remodelled and docks have been built. The European garrison is stationed at Kolaba at the southern extremity of the island. Batteries armed with the newest guns are placed both on the mainland and the islands.

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Bombay, India: The Victoria Railway Station, Main Entrance

Mazagaon Bay, the centre of shipping activity, is at the head of the harbor. Always favorably situated for foreign trade, Bombay has profited largely by being the first important port reached by vessels from Europe, and by being the chief mail line to India by Suez and Aden. All but an insignificant portion of the trade of the presidency passes through the port. Bombay suffered less from the Great War than other Indian ports, although shipping was seriously affected. The chief articles of export are raw cotton, wheat, hides, coffee, pepper, linseed, manganese, gums, opium, ivory, and shawls; the chief imports, piece goods, thread, yarn, silk, wine, beer, tea, iron and steel goods, and coal. There are large cotton mills, tanneries, dye works, and shops for metal working.

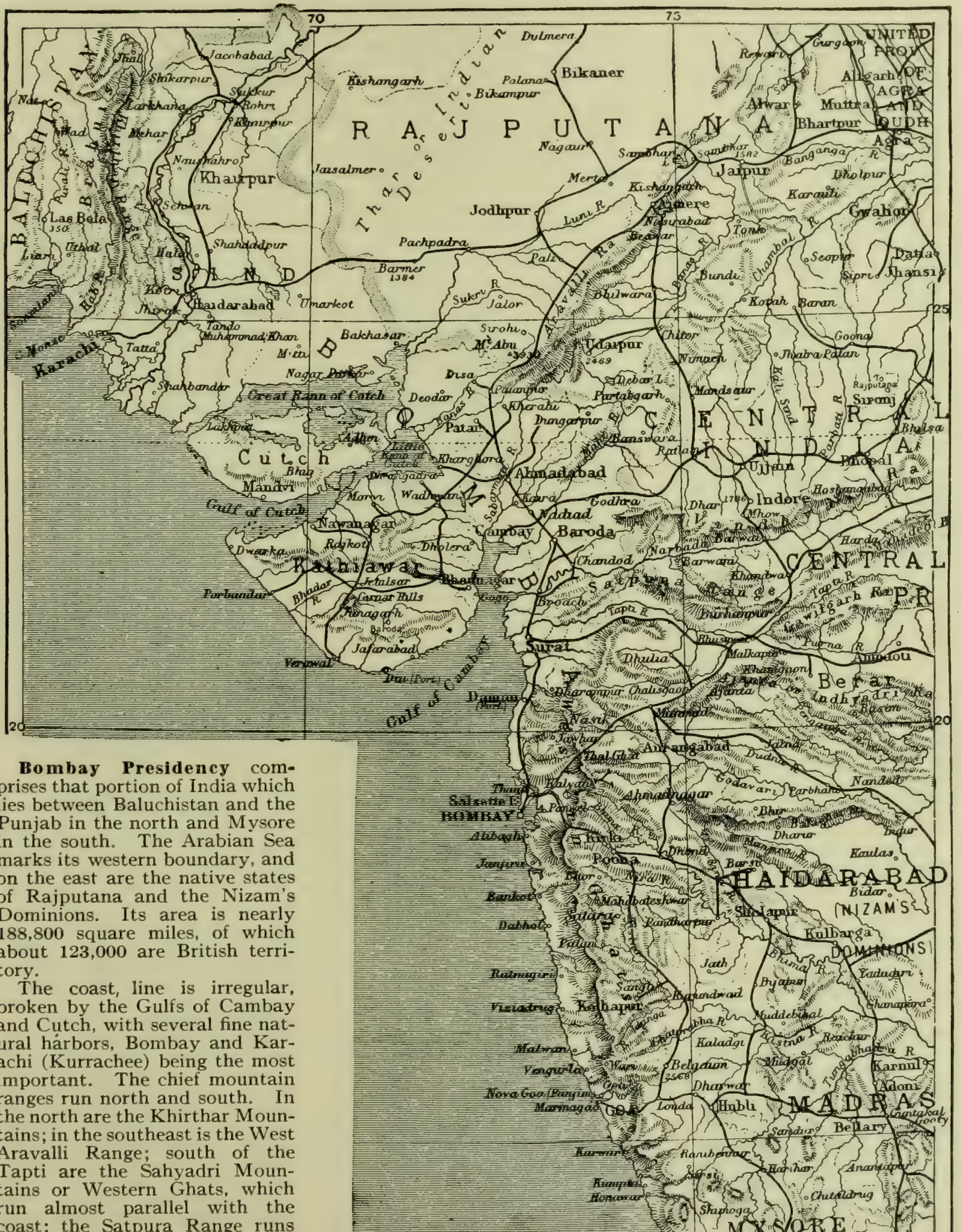
Bombay is the headquarters of the government of the presidency, over which a high court exercises supreme jurisdiction. Besides the University, there are the Government Elphinstone College, art colleges, the Grant Medical College, missionary colleges, a technical institute, and a law school. Numerous high schools and orphanages, initiated by the efforts of Christian bodies, have been extended by the native merchant princes; and several hospitals, including one for lepers, are maintained by its citizens. In municipal enterprise Bombay holds its own with the foremost cities of Europe. Since 1897 several visitations of bubonic plague have occurred, but an extensive scheme of sanitary improvement has been instituted.

Hindus and Mohammedans are the most numerous of the inhabitants, and include not only natives of India, but also Afghans, Arabs, Malays, and Africans. The Parsees rank next to the English in position and influence. There are also influential communities of Jews, Europeans, and Americans. Pop. (1911) 972,892. (1921) 1,175,914.

History.—In 1509, about a year before the capture of Goa, the Portuguese visited the island; and by 1532 they had made it their own. In 1661 they ceded it to Charles II. of England, as part of the dowry of his bride, the Infanta Catharine. In 1668 that monarch granted it for an annual payment to the East India Company, which in 1685 transferred what was then its principal presidency to Bombay from Surat. Consult Forrest's *Cities of India*.

Bombay Duck (*Harpodon nehereus*), or BUMMALOTI, marine fish found in abundance on the east coast of India. Salted and dried, it is used to flavor rice, and forms part of all Indian curries.

The fish itself, which is caught in vast numbers and exported, is long, and has large fins and a very wide mouth.



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Bombay Presidency

Bombay Presidency comprises that portion of India which lies between Baluchistan and the Punjab in the north and Mysore in the south. The Arabian Sea marks its western boundary, and on the east are the native states of Rajputana and the Nizam's Dominions. Its area is nearly 188,800 square miles, of which about 123,000 are British territory.

The coast, line is irregular, broken by the Gulfs of Cambay and Cutch, with several fine natural hårbors, Bombay and Karachi (Kurrachee) being the most important. The chief mountain ranges run north and south. In the north are the Khirthar Mountains; in the southeast is the West Aravalli Range; south of the Tapti are the Sahyadri Mountains or Western Ghats, which run almost parallel with the coast; the Satpura Range runs east, and forms the watershed between the Tapti and Narbada.

Sindh is watered and fertilized throughout its whole length by the River Indus, which enters the Arabian Sea in a wide delta; the Submarti and Mati flow through the plains of Northern Guzerat; the Narbada pursues a westerly course into the Gulf of Cambay. The Tapti flows through Khandesh district, entering the sea above Surat. The Rann of Cutch, in the west of Guzerat, is an inland lake which, when in flood, becomes an arm of the sea. It covers an area of about 8,000 square miles, and is the great source of salt supply for the presidency.

The country generally is fertile. In Sindh, where there are stretches of sandy desert, irrigation has brought large tracts under cultivation. Forests are scattered along the mountain ranges, and cover extensive areas on the banks of the Indus. During the fair weather traffic along the coast line is brisk.

There are few minerals, and no coal; iron is mined at Tagar in Dharvar, and there is gold mixed with the quartz. Good building stone is abundant, with limestone and slate. The principal agricultural products are millet, legumes, rice, wheat, cotton, oil seeds, tobacco, indigo, and cane sugar.

Of late years, manufacturing industries have been extremely active in Bombay. Commanding the richest cotton fields in India, it has improved to the utmost its natural advantages. There is still a large but decreasing import of cotton goods from England; and while the Indian cotton trade has often been greatly depressed, Bombay not only competes with Manchester in the Indian markets, but largely exports its own manufactures. After cotton, the other great staples are wheat, seeds, and opium. Although of recent origin, the wheat trade has assumed large proportions, but the opium trade has fallen off. Other leading exports are sugar, tea, raw wool, woollen shawls, fibres, and drugs; while among the imports are cotton manufactures, metals and ores, machinery, and manufactures of iron and steel. Silk weaving is carried on at Ahmedabad, Surat, Nasik, Yeola, and Poona; carpets are made at Ahmednagar; leather work and pottery in Sindh; brassware in Bombay city, Nasik, and Poona; cutlery, armor, and gold and silver work in Cutch.

The presidency has more than 3,500 miles of railroad, giving communication with the important towns of India. Three main lines of railway from Bombay tap the Nizam's Dominions, the Central Provinces, and Rajputana; the cotton-growing province of Kathiawar is being covered with a network of lines. A military line from Karachi leads to the northern frontier, and this port is in railway communication with the Punjab and Rajputana. The post office and telegraphs are controlled by the imperial government, both in British territory and in native states. A cable telegraph from Bombay to Aden was laid in 1869.

The executive government is vested in a governor and two councillors. For administrative purposes the presidency proper is divided into nineteen districts. Local self-government is in its infancy, but municipalities have been established in the larger towns; and for legislative purposes the executive government is assisted by a council of Europeans and natives.

Of the territories under native rule the most important is Baroda, which is practically under the direct control of the imperial government. In all the native states the British government is represented by political officers. The chiefs have surrendered the right to manufacture opium, salt, and native intoxicating drinks (*abkari* dues), and the jurisdiction over railway lands. The chiefs of Kolhapur, Cutch, and a few in Kathiawar, possess plenary powers.

The inhabitants comprise numerous races, who profess divers creeds. The majority (75 per cent.) are Hindus—a term used to comprehend pure Brahminism, as well as the worship of Vishnu and Siva under various systems; a small but influential body are Parsees; and the proselytizing faiths are represented by Buddhists, Mohammedans (20 per cent.), and Christians. The languages principally spoken are Marathi (50 per cent.), Gujarari (20 per cent.), and Sindhi (15 per cent.). Pop. (1911) 27,074,570; (1921) British possessions, 19,348,219; Native States, over 4,000,000.

Bombazine, bom-b*a*-zēn′, a cloth for dresses, in which the distinguishing characteristic is that the warp is silk and the weft worsted, giving the cloth a somewhat stiff and shiny look. The fabric was extensively made, chiefly at Norwich, England, from about 1816 but it is now little used.

Bombetoke, Bay of, bom-be-tō′k*a*, inlet on the northwest coast of Madagascar, on which stands the seaport of Majunga (q.v.).

Bombinator. See TOAD.

Bomb Proofs. See CASEMATE.

Bombyx. See SILK.

Bom Fim, bôṅ fēṅ, town, Brazil, in the state of Goyaz, 164 miles southeast of the town of Goyaz. It has gold mines. Pop. 6,000.

Bommelö, bom′*e*l-û′, island, Norway, off the west coast, between Stavanger and Bergen.

Bomvanaland, bom-vä′nä-länt, native district, Africa, in Tembuland, Cape Colony, lying on the eastern coast between the Bashee and Umtata Rivers.

Bon, CAPE, or RAS ADDAR, headland, the northernmost point of Africa; 58 miles northeast of Tunis.

Bona, the general term in Roman law for the property of any one, and in the modern system it is used in various connections. A thing is said to be *in bonis* of a person when it is part of his belongings. *Bona vacantia* in Roman law denoted the property of one who had died intestate and without leaving any legal representative who claimed the inheritance. In English and American law the same term is applied to such things as wrecks, treasure trove, waifs, estrays, etc., which belong not to the finder or occupier, but to the Crown or state. *Bona waviata* denote goods thrown away by a thief through fear of apprehension. At common law these belong to the owner if he prosecutes to conviction; otherwise they go to the Crown or state. *Bona notabilia* are goods of a deceased, the value of which is not so small as to render them negligible, and which must therefore be *noted* and accounted for by the executor or administrator. *Nulla bona* is the technical description of a return of an execution, where *no goods* are found to satisfy the claim. In English and American law *bona* includes only personal or movable property, not real property.

Bona (French *Bône*), fortified seaport town, Algeria, in the province of Constantine on the Sebus River, 85 miles northeast of Constantine. It has a fine harbor. The exports include phosphates, iron, zinc, lead, copper, cork wood, and briar roots. Bona was occupied by the French in 1832. To the south are the ruins of Hippo Regius, the see of Augustine, who died here in 430. Pop. (1921) 45,171.

Bona Dea ('the good goddess'), a Roman divinity, sister, wife, or daughter of Faunus, and variously known as FAUNA, FATUA, or OMA. Her worship was exclusively confined to women, and she was reverenced as a chaste and prophetic deity. Her sanctuary was a grotto on the Aventine Hill. On May 1 of every year her festival was held in the house of the consul or prætor. The solemnities were performed generally by high-born vestals, no males were allowed to be present, and even portraits of men were veiled.

Bona Fides (Latin, 'good faith,' as opposed to *mala fides*, 'bad faith'), a legal term to denote the condition of one who becomes a purchaser of property without notice of equitable claims affecting it in the hands of the vendor. Such a purchaser, if his legal title is good, is protected against the equitable claims of third persons. Any *bona-fide* purchaser will be supported by a court of law. If notice of the rights of a third party has been given to the purchaser, he will only stand in the same position as the person from whom he has purchased the goods in any question as to the legal ownership. This law applies equally to commercial documents. If any sale or contract can be proved not to have been made in good faith, it can be set aside on the petition of the injured party. In cases of slander and libel, if it can be shown that the statements were made *bona fide* and not maliciously, the action must fail.

Bonai, the most southerly of the feudatory states of Chota Nagpur, Bengal, India; consists of a valley, surrounded by the Bonai Hills. Area, 1,349 sq. m.

Bonaire. See Curaçao.

Bonald, Louis Gabriel Ambroise, Vicomte de (1753–1840), French philosopher and statesman, born at Mouna (Aveyron). He retired with other royalist *émigrés* to Heidelberg in 1791, and there wrote *Théorie du Pouvoir Politique et Réligieux dans la Société Civile* (3 vols. 1796). At the restoration he became a member of the Council of Public Instruction, minister of state (1822), and was ennobled (1823). His principal works were *Législation Primitive* (1802), *Recherches Philosophiques* (1818), *Mélanges Littéraires* (1819). His *Œuvres* were collected in 12 vols., 1817–19. See Damiron, *Phil. en France au XIX*^{e} *Siècle* (3rd ed. 1834); and *Life* in French by Bonald's son Victor (1853).

Bonanza (Lat. *bonus*, through the Spanish), a miner's term for the discovery of a rich vein of ore. The 'Big Bonanza,' one of ten in the Comstock Lode, was struck in 1876. By analogy the term expresses any stroke of good luck.

Bonanza Creek, in the Yukon dist., Canada, joins the Klondike R. 2 m. from Dawson. It is rich in deposits of gold.

Bonaparte, Charles Joseph (1851), American lawyer and cabinet officer, was born at Baltimore, Md., a grandson of Jérome Bonaparte, king of Westphalia. He graduated at Harvard in 1871 and at the Harvard Law School in 1874, and practised in Baltimore. In 1902–4 he was a member of the Board of Indian Commissioners, and he has also served as chairman of the Council of the National Civil Service Reform League, president of the National Municipal League and a member of the National Civic Federation. In 1905 he was appointed Secretary of the Navy, and was Attorney-General from 1906 to 1909.

Bonaparte, Napoleon. See Napoleon I.

Bonapartes, The. The surname Bonaparte or Buonaparte was borne by various Italian families during the middle ages, and it occurs in Corsica in the 10th century. Their name was entered in the 'Golden Book' at Treviso as of noble rank.

Bonaparte, Charles, or Carlo Buonaparte (1746–85), was a Corsican lawyer, and an adherent of the patriot Paoli. In 1767 he married Maria Letitia Ramolini, a strong-minded and accomplished patrician lady. On the failure (1768) of Paoli's rebellion, Charles Bonaparte accepted the French rule; and in 1773 he was appointed royal counsellor and assessor of the town and province of Ajaccio. In 1793 Napoleon's mother went to Marseilles; but on Napoleon becoming first consul she removed to Paris. She was styled 'Madame Mère' after his coronation in 1804. She accompanied Napoleon to Elba, and after Waterloo she resided with her step-brother, Cardinal Fesch, at Rome, where she died in 1836. See *Madame Mère*, by Larry (1892). Among her children were:—

(1.) Bonaparte, Joseph (1768–1844). Expelled from Corsica by the partisans of Paoli, he emigrated to Marseilles; and later, when his illustrious brother rose into power, he was appointed commissary-general, and in 1797 was sent as ambassador to the Pope. In 1800 he was chosen plenipotentiary to the United States to conclude a treaty of friendship between that country and France. He negotiated the treaties of Lunéville (1801) and Amiens (1802). In 1806, much against his will, he accepted the throne of Naples; and in 1808 his brother made him king of Spain. He tried in vain to abdicate; but Wellington's triumph at Vitoria in 1813 at length put an end to his mock sovereignty. On the final fall of his brother he emigrated to the United States, where, under the name of the Count de Survilliers, he lived at Bordentown, N. J., from 1815 until 1832, when he returned to Europe, and died in Florence. See Du Casse's *Mémoires du Roi Joseph* (1856–8).

(2.) Bonaparte, Napoleon. See Napoleon I.

(3.) Bonaparte, Lucien (1775–1840). In 1798 he was elected to the Council of the Five Hundred, where, as president, he rendered great service to Napoleon on the 18th Brumaire. He was subsequently minister of the interior, and in 1800 was sent as ambassador to Spain. Having married Madame Jouberthon against the wishes of his brother, he went into retirement in Italy, where he was created Prince of Canino by the Pope. Napoleon's displeasure obliged him in 1810 to leave Rome, and he embarked for the United States, but was captured by the British, who detained him until 1814. Becoming reconciled to his brother, he stood by him during the struggle of the Hundred Days; and it was by his advice that the emperor abdicated in favor of his son. When Louis XVIII. ascended the throne, Lucien Bonaparte retired with his family to Italy, where he died. See Jung's *Lucien Bonaparte et ses Mémoires* (1882–3).

Prince Lucien Bonaparte left five sons and two daughters. The eldest son, Charles Lucien Jules Laurent Bonaparte (1803–57), married his cousin Zénaïde, the daughter of Joseph Bonaparte, in 1822, and lived in Philadelphia (1822–28) and became known as a naturalist and especially as an ornithologist. His *American Ornithology* (1824–33) was afterward combined with the work of Wilson, as *Wilson and Bonaparte's Ornithology*, a work which is still very valuable. He also published *Illustrations of the Italian Fauna* (in Italian) in 1832–41; *Conspectus Generum Avium*, in 1850–7; besides other books. He succeeded to his father's title in 1840. Returning to Europe, he mingled for a time in politics on the republican side, but in 1849 settled quietly in Paris. One of his sons, Lucien, became (1868) a cardinal in the Church of Rome.—Paul Marie Bonaparte (1808–27), second son, took part in the Greek war of liberation, fighting on Lord Cochrane's ship.—Louis Lucien Bonaparte (1813–91), the third son, became an eminent philologist, and an authority upon the Basque (*Langue Basque*, 1862) and Celtic languages. The catalogue of his works (1858–88) includes no fewer than 222 books written either by himself or under his supervision. He ultimately settled in England, and was awarded a pension of £250 from the British civil list.—Pierre Napoleon Bonaparte (1815–81), the fourth son and the black sheep of the family, spent the early years of his erratic career in Italy, Belgium, and America. Returning to France in 1848, his acts caused great annoyance to his cousin, Napoleon III. In 1870 he shot and killed Victor Noir, the journalist, with whom he was to fight a duel. Brought to trial, he was acquitted of murder, but was ordered to pay a sum of money to the Noir family. His remaining years were spent in England.

(4.) Bonaparte Marie Anne Elisa (1777–1820), married (1797) a captain in the French army, named Felice Bacciocchi. She was a clever woman, and when, in 1805, Napoleon erected Lucca and Piombino into a principality, he conferred upon her the government. She became Grand-duchess of Tuscany in 1809. See Turquan's *Les Sœurs de Napoléon* (1896).

(5.) Bonaparte, Louis (1778–1846), king of Holland, was in his brother's Italian and Egyptian campaigns. In 1802, in deference to the wishes of Napoleon, he married Hortense (1783–1837), daughter of General Beauharnais by his

The Bonaparte Family.
1. Charles, and 2, Letitia, the father and mother. 3. Napoleon I. 4. Joseph. 5. Lucien. 6. Louis. 7. Jérome.

wife Josephine, afterward empress of the French. The union was very unhappy, and the pair spent most of their married life apart. In 1806 Louis was made king of Holland; but declining to carry out Napoleon's tyrannical policy, he retired in 1810 in favor of his son, and Holland was annexed to France in the same year. He was the author of *Documents Historiques, etc., sur le Gouvernement de la Hollande* (1821); *Histoire du Parlement Anglais* (1820); *Réponse à Sir W. Scott* (1829); and a critique upon Norvins's *Histoire de Napoléon* (1834). After the final defeat of Napoleon, Hortense Bonaparte settled in Switzerland. She was the authoress of *La Reine Hortense en Italie, en France, et en Angleterre* (1833), and of a number of songs, including the popular *Partant pour la Syrie.* The third son of Louis and Hortense Bonaparte was Charles Louis Napoleon. See Napoleon III.

(6.) Bonaparte, Marie Pauline (1780–1825), also called Carlotta, was Napoleon's favorite sister, and, with her mother, shared his exile at Elba. She was married first (1801) to General Leclerc, afterward (1803) to Prince Borghese. Canova immortalized her beauty as Venus Victrix.

(7.) Bonaparte Caroline Marie Annonciata (1782–1839), married Murat, king of Naples, in 1809, and shared in all his vicissitudes.

(8.) Bonaparte, Jérome (1784–1860), king of Westphalia, the youngest brother of Napoleon I., was born at Ajaccio, and served as naval lieutenant in the Hayti expedition (1801). When, two years later, war broke out between France and England, Jérome, who was in the West Indies, fled for safety to New York, and in December of that year (1803) was married to Elizabeth Patterson of Baltimore. The marriage was annulled by Napoleon in 1805, and Madame Bonaparte was not allowed to enter France in spite of Jérome's earnest entreaties. A few years later Jérome, then king of Westphalia, was compelled to marry Catharine of Würtemberg. In 1806 he fought in the war against Prussia, and in 1807 was made king of Westphalia. He took part in the Russian expedition of 1812, commanded a division at Waterloo, and thereafter settled in Florence. On his return to France in 1848 he was appointed governor of the Invalides, and in 1850 was created a marshal of France. His third son by his second wife was Napoleon Joseph Charles Paul Bonaparte, known as Prince Jérome Napoleon (1822–91) and nicknamed 'Plon-Plon.' He was banished from France in 1845, on account of his republican tendencies. In 1848 he was elected to the National Assembly, and served with the army in the Crimean War. He married, in 1850, Princess Clotilde, daughter of Victor Emmanuel; and their eldest son, Prince Victor Napoleon (1862), is now the head of the Bonaparte family.

See Napoleon; Du Casse's *Mémoires et Correspondance du Roi Joseph* (1853–5); Bingham's *Marriages of the Bonapartes* (1881); *Mémoires Secrets de Lucien Bonaparte* (1819); *Mémoires de la Cour de Louis Napoléon;* Wouter's *Les Bonapartes depuis* 1815 (1841); Du Casse's *Mémoires du Roi Jérôme* (1861–6); and Martinet's *Jérôme Napoléon, Roi de Westfalie* (1902); Didier's *Life and Letters of Madame Patterson-Bonaparte* (1879), and Williams

Died May 3, 19[illegible]
1926

and Lester, *The Napoleonic Dynasty* (1860).

Bonar, Horatius (1808–89), Scottish divine and hymn-writer; born and educated at Edinburgh; appointed minister of Kelso in 1837. He seceded with the Free Church at the Disruption in 1843, and became minister of Chalmers' Memorial Church, Edinburgh, in 1866. He published numerous religious works, notably *Hymns of Faith and Hope* (1857–66; new ed. 1886), eighteen of which are in *Scottish Hymnary*. See *Horatius Bonar, D.D.: a Memorial* (1889).

Bonaventura, or Buonaventura, St. (1221–74), scholastic theologian and mystic, surnamed 'the Seraphic Doctor,' was born at Bagnorea in Tuscany. In 1238 he became a Franciscan friar. He received his doctor's degree at Paris after a great controversy, and in 1257 became minister-general of the Franciscans. He accepted the bishopric of Albano, and in 1273 was created a cardinal. He accompanied Gregory X. to the Council of Lyons, during the session of which he died (1274). Dante placed him among the saints in canto xii. of the *Paradiso;* and in 1482 he was canonized by Sixtus IV. His principal works are the *Breviloquium*, the *Itinerarium Mentis in Deum*, *De Reductione Artium ad Theologiam*, and the *Biblia Pauperum*. His works were collected in 8 vols. folio (Rome, 1588–96) and 10 vols. quarto (1882–92). Works upon his life, character, and writings have been written by Hollenberg (1862), Vicenza (1874), Richard (1873), Borgognoni (1874), and De Chévancé (1899).

Bonavista, seapt., Bonavista dist., Newfoundland, 77 m. N.N.W. of St. John's, on cape and bay of Bonavista. The inhabitants are chiefly engaged in fishing and navigation. It is one of the oldest settlements in Newfoundland. The dangers of navigation in the bay are reduced by a lighthouse on Cape Bonavista with a revolving red and white light 150 ft. above sea level. Pop. (1899) 3,550.

Bonchamp, Charles Melchior Arthur, Marquis de (1760–93), Vendéan general, born at Jouverdeil in Anjou. He served in the Revolutionary War in America, and upon his return to France was made a captain. Appointed a leader by the Vendéans, he frequently defeated the republican troops, but was mortally wounded before Cholet in 1793. His last act was to ensure the safety of 5,000 republican prisoners on whom the insurgents were about to wreak their vengeance. See *Life* by Chauveau and Dussieux (1817), and Blachet's *Bonchamp et l'Insurrection Vendéenne* (1902).

Bond. An instrument under seal by which one person, called the obliger, promises to pay another, known as the obligee, a specified sum of money. It is often employed when it is sought to secure under penalty—in a money bond usually double the sum actually due—the performance of something, either the payment of money or the doing of some act; in such cases the obligation is to become void on the happening of the particular event. At common law, on failure of the condition named in the bond, the full penal sum became payable; but the law now only permits the obligee to receive the amount of his actual loss. In many of the United States the debt or money obligation secured by a mortgage on real property is usually in the form of a bond. This is especially the case in the securities issued by railroads and other private corporations. Government securities are usually in the form of bonds, though these are not usually based on mortgages. Though not strictly negotiable instruments, corporate bonds of all kinds are freely transferable and constitute a favorite form of investment of private capital.

Bond, a term used in bricklaying and masonry to indicate the arrangement of the bricks or the stones. See Bricklaying.

Bond, Afrikander. See Africander.

Bond, Sir Edward Augustus (1815–98), chief librarian of the British Museum, was born at Hanwell, near London, and entered the British Museum as a palæographer in 1838, becoming keeper of the MSS. (1866) and chief librarian (1878). With Sir E. Maunde Thompson he founded the Palæographical Society (1870). He was created C.B. (1885) and K.C.B. (1898). He edited *Speeches in the Trial of Warren Hastings* (4 vols. 1859–61), *Chronica Abbatiæ de Melsa* (Rolls Series, 1858), *Statutes of the University of Oxford* (1853), and a complete *Catalogue of the MS. Collections in the British Museum* (1870–5).

Bond, Sir Robert (1857), premier and colonial secretary of Newfoundland, was born in Newfoundland. Having studied for the bar, he was elected to the Newfoundland Assembly (1880), appointed Speaker (1884), executive councillor and colonial secretary (1889–97), and premier (1900). He was a delegate to England relative to the French treaties question (1890), was mainly instrumental in carrying through the Bond-Blaine convention (1890), and negotiated with Secretary Hay the Hay-Bond treaty which the U. S. Senate refused to ratify. He was also a delegate on the Newfoundland fisheries question (1892), and chairman of the Ottawa conference (1895).

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Bond, William Cranch (1789–1859), American astronomer, was born in Portland, Me., and educated himself. He established a private observatory at Dorchester, Mass., and caused some sensation in the astronomical world by his discoveries; was appointed (1838) by the U. S. government to make observations for the use of the Wilkes's exploring expedition to the South Pacific; and became director of the observatory at Harvard University in 1840. He discovered the eighth satellite of Saturn (Sept. 19, 1848), invented the chronograph (1850), and was one of the first (1848) to photograph celestial bodies.

Bonde (pl. *bönder*), originally, in the Scandinavian north, a peasant freeholder (odal owner); now, however, synonymous with peasant as ordinarily understood.

Bonded Warehouse, a warehouse used for storing bonded goods—*i.e.*, goods subject to internal revenue or customs duty, but on which the duty has not been paid. Such goods are warehoused under government supervision. When removed for sale within the country the duty is paid; when removed for exportation no duty is paid. See Warehouse.

Bondeno, tn., prov. Ferrara, Italy, 11 m. by rail N.W. of Ferrara, on the Panaro. Rice and hemp are grown in the neighborhood. Pop. (1901) 15,682.

Bondi, Clemente (1742–1821), Italian poet and Jesuit, born at Mezzano in Parma. After the suppression of his order he devoted himself to literature, and became (1797) librarian to the Archduke Ferdinand at Brünn, and in 1815 professor of history and literature at Vienna, where he died. His poems, including his most famous work, *Giornata Villereccia*, as well as French translations of Virgil and Ovid, were published in 3 vols. (1808).

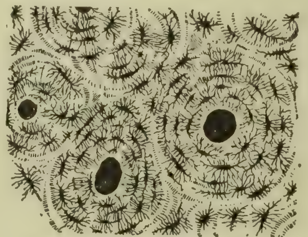
Bonds. See Stocks and Bonds; Stock Exchange.

Bondu, a native Fulbe kingdom of W. Africa, in the French colony of Senegal, between the middle Gambia and the Faleme; is well watered and fertile, and produces iron and gold, cotton, indigo, tobacco, and the usual W. African products. Pop. 500,000. It became French in 1858.

Bonduku, tn., West Africa, in the French colony of the Ivory Coast, close to the W. boundary of Ashanti, and in about 7° 45′ N. lat.

Bone is one of the hardest structures of the animal body, and possesses also a certain degree of toughness and elasticity. It serves as the framework or skeleton of the body, supporting the softer structures, forming the joints, and protecting the viscera. Its color, when fresh, is light pink externally and deep red within. It is composed of earthy and animal matter in the proportion of 67 per cent. of the former and 33 per cent. of the latter. Of the earthy matter 56 per cent. is calcium phosphate, the rest being calcium carbonate, calcium fluoride, and magnesium phosphate. Rickets, mollities, ossium, and caries are associated with deficiency of the earthy matters. The organic substance is chiefly collagen—a substance which is converted into gelatin by boiling. A section of bone is seen to be composed of two kinds of tissue—one external, hard like ivory, a compact and dense tissue; the other internal, a spongy or cancellous tissue resembling a lattice-work. The shaft of a long bone consists of compact bone surrounding a central canal or 'medullary cavity,' so called from its containing the medulla or marrow. Bones are enclosed in a fibrous membrane, the 'periosteum,' by means of which many of the blood-vessels reach the hard tissue. When the periosteum is stripped from the surface of a living bone, the small bleeding points which are seen mark the entrance of the periosteal vessels; the long bones are supplied also by a nutrient artery which enters at the 'nutrient foramen' in the shaft, reaches the medullary cavity, and breaks up into branches, from which small vessels are distributed to the interior of the bone for the supply of the marrow. Veins emerge from the long bones in various places. Examined with a lens of low power, a section of bone is seen to be divided into a number of circular areas, each of which consists of a central hole surrounded by a number of concentric rings. These areas are called Haversian systems. The central hole is a Haversian canal. The average diameter of the Haversian canals is one five-hundredth of an inch; they contain blood-vessels, and minute canaliculi and lacunæ convey the lymph which is exuded from the blood-vessels to the substance of the bone which they traverse. The lacunæ are occupied by branched cells, called bone cells or bone corpuscles, each of which is a little mass of protoplasm, and serves for the nutrition of the bone immediately surrounding it. One lacunar corpuscle communicates with another, with its surrounding area, and with the blood-vessels of the canals, by means of the minute streams of nutrient lymph which occupy the canaliculi. In the shaft of a long bone three distinct sets of lamellæ can be recognized—circumferential lamellæ, seen best just beneath the periosteum; Haversian lamellæ, round the canals; and interstitial lamellæ, which connect the systems of Haversian lamellæ.

Bone grows in girth by the deposition of layers under the periosteum, like successive rings under the bark of a growing tree. Duhamel placed silver rings round the bones of young pigeons, and when these were killed the rings were found completely covered in by bone; in the animals killed last they were found in the central cavity. John Hunter fed pigs alternately on ordinary food and on food dyed by the red pigment madder. The rings of bone deposited during the madder period were red, and easily distinguished from the others.



Section from Shaft of Humerus (× 75).

Diseases of bone may be classified as follows: *Bacterial diseases*—pyogenic, tuberculous, syphilitic. *Parasitic diseases*—actinomycosis, mycetoma, hydatid cysts. *Trophic diseases*—rickets, scurvy, osteomalacia, osteitis deformans, fragilitas ossium. *Tumors and cysts.*

Pyogenic disease of bone results from infection with pus-forming organisms, and occurs chiefly before the growth of the skeleton is completed. The *staphylococcus aureus* is the cause of various forms of osteomyelitis and periostitis, of chronic abscess of bone, and of necrosis, with or without suppuration. Other organisms causing bone disease are *pneumococcus* and the typhoid bacillus. Pyogenic diseases of bone also arise from direct infection through a wound or other breach of surface, as in amputations, in compound fractures, and in diseases of adjacent soft parts. Tubercular disease of bone occurs very frequently as the result of the infection of the marrow and periosteum by tubercle bacilli, which have been conveyed to those tissues through the arteries. Syphilitic disease of bone is caused through infection by the syphilitic virus as a consequence of the general disease.

Bones are frequently the seat of tumors, both primary and secondary. Examples of primary tumors are osteoma, chondroma, sarcoma, and fibroma; and of secondary tumors, carcinoma. For the morphology of bones, see SKELETON.

Bone, HENRY (1755–1834), English painter, was born at Truro. He went to London in 1778, and was employed in enamelling watches and fans, and in enamel painting. His chief works are a series of historical portraits of the time of Elizabeth, *Bacchus and Ariadne*, and the *Cavaliers Distinguished in the Civil War.* He was appointed enamel painter to the king in 1801, and a R.A. in 1811. See Sandby's *Hist. of the Royal Academy* (1862), and Clement's *Painters, Sculptors, Architects, and Engravers* (1899).

Bone Ash, OR BONE EARTH, the residue obtained by calcining bones in the presence of air until they are white, consists chiefly of calcium phosphate, together with some carbonate. It is used in the manufacture of cupels for assaying, in the preparation of phosphoric acid and phosphorus, and is the basis of several artificial fertilizers.

Bone-Black, or ANIMAL CHARCOAL, is obtained by heating bones, from which the fat has been removed by a solvent or by boiling, in retorts from which air is excluded. The bone-black contains phosphate and carbonate of lime, with about 10 per cent. of carbon, in a state of very fine division. Its principal use is in sugar-refining, a solution of raw sugar filtered through it being completely decolorized.

Bone Fertilizers. The fertilizing value of bones is determined by the phosphoric acid and nitrogen they contain. The proportion of these constituents depends upon the kinds of bones and the treatment to which they have been subjected. Raw or untreated bones consist chiefly of tricalcin phosphate, $Ca_3(PO_4)_2$, bound together by gelatinous matter rich in nitrogen, and contain when well cleaned as high as 25 per cent. of phosphoric acid and 5 per cent. of nitrogen. When burned, bones yield an earthy residue known as bone ash, which contains from 30 to 35 per cent. of phosphoric acid, when of good quality, but no nitrogen. This material is used to a limited extent in the preparation of superphosphate, $CaH_4(PO_4)_2$, by treatment with sulphuric acid. Bones are also charred in closed retorts to prepare a product known as bone-black. This is extensively used for clarifying solutions, particularly syrups, as a pigment, and as a fertilizer either directly or after treatment with sulphuric acid to produce what is known as dissolved bone-black or bone-black superphosphate. Bones are directly treated with sulphuric acid, yielding the so-called dissolved bones, in which the insoluble tricalcin phosphate of the original bones has been converted into the soluble superphosphate by the treatment with acid. This method of treating bones is, however, little used at the present time, superphosphates being more cheaply prepared from the mineral phosphates. The larger part of the bone used for fertilizers is either boiled or steamed at high temperatures. This treatment removes the fat and a part of the gelatinous matter (and hence part of the nitrogen). Steamed bone of good quality contains about 30 per cent. of phosphoric acid and 1½ to 2 per cent. of nitrogen. The mechanical condition of the bone is improved by steaming, and this, as well as the removal of fat, improves its availability when used as a fertilizer. When a considerable amount of meat scraps or other animal refuse is left with the bones a variable product, known as bone tankage, is obtained, which is usually richer in nitrogen and poorer in phosphoric acid than unmixed bones. This product is very extensively used, especially in the preparation of mixed fertilizers.

Bones which have not been treated with acid form a slow-acting fertilizer which is less efficient on calcareous soils than on those less liberally supplied with lime. The fertilizing value of such bones depends to a large extent upon the degree of fineness to which they have been reduced; the finer the bones the quicker their action and the less lasting their effect. Bones give best results on slow-growing crops.

Boner, Charles (1815–70), English poet and traveller, born at Bath; lived on the Continent from 1840, and was, after 1865, correspondent at Vienna and at other places of the *Daily News*, the New York *Tribune* and other papers. He published *Verse* (1858); *Forest Creatures* (1861) —*i.e.* the game of Germany; *Transylvania: its Products and its People* (1865). He also translated several of Hans Andersen's fairy tales—*A Danish Story-book* (1846), *Nightingale* (1846), *The Shoes of Fortune* (1883). See *Memoir and Letters of Charles Boner* (2 vols. 1871), and *Memorials* (2 vols. 1875).

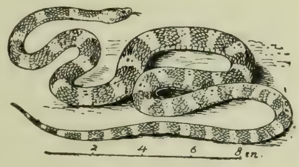
Boner, Ulrich, writer of fables, a native of Bern, flourished in the second quarter of the 14th century. He compiled the oldest book of fables in German, his *Edelstein*, to serve as a 'talisman' against the evils and errors of the world. There are a hundred fables, taken from the Latin collections of Avianus and the *Anonymus Neveleti*, they are told in simple language, not without grace, and each has its moral, often far-fetched, and in some cases even incongruous. There is a critical edition by Pfeiffer (1844) and modernized selections have been prepared by Oberbreyer (1880) and Pannier (1895).

Boneset. A sturdy composite plant (*Eupatorium perfoliatum*) used in domestic medicine. It is a perennial, sending up clusters of tall, hairy stems, with characteristic connate-perfoliate, lanceolate leaves, and massive heads of flowers, which are white and rayless.

Bo'ness. See Borrowstounness.

Bonfire ('bone-fire,' 'fire of bones'), probably originating in the funeral pyre. Bonfires were lighted in early times to avert plagues or evil spirits, and became connected with ceremonial observances (*cf.* the lighting of fires on the eve of St. John's Day or Midsummer Eve). The burning of effigies in such fires may be a relic of propitiatory sacrifices. Firmly rooted in the pagan mind, they were adopted and consecrated by the church: thus, in the Catholic Church the new fire is blessed at Easter, and in the Orthodox Greek Church lighted tapers are carried at that festival. Bonfires are frequently lighted on occasions of public rejoicing, this being especially true of the U. S. The custom of lighting bonfires on Guy Fawkes Day (November 5) still survives in England. See Beacon; Beltane; and Brand's *Popular Antiquities*, i. (1849).

Bonga, tn., cap. of Kaffa, 340 m. s.s.w. of Debra Tabor, Abyssinia; trades chiefly with the Galla countries.



Bongar, or Krait.

Bongar, a name sometimes applied to certain poisonous snakes of the genus *Bungarus*, one of which is the deadly *crait* or *krait* of India. The snakes of this genus are closely allied to the cobra. The krait (*B. candidus*) is dark brown or bluish black above, with bands or spots of white or yellow, and uniform white below. The length does not exceed 4 ft. It is very common in Bengal and S. India, and is said to cause more deaths than any other Indian snake.

Bongardia, a genus of the barberry family. One species only is known, *B. Rauwolfii*, a small, stemless plant, found in Greece, Syria, Persia, and Afghanistan, with a tuberous underground root-stock. The Persians roast or boil the tubers for food; the leaves are eaten like sorrel.

Bon Gaultier Ballads, parodies of modern poetry written by Professor W. E. Aytoun and Sir Theodore Martin (1840–4). They were reprinted from *Blackwood's Magazine* in thirteen editions between 1855 and 1857. The pseudonym 'Bon Gaultier' was that adopted by Martin when he wrote in *Fraser's Magazine* and *Tait's Edinburgh Magazine.*

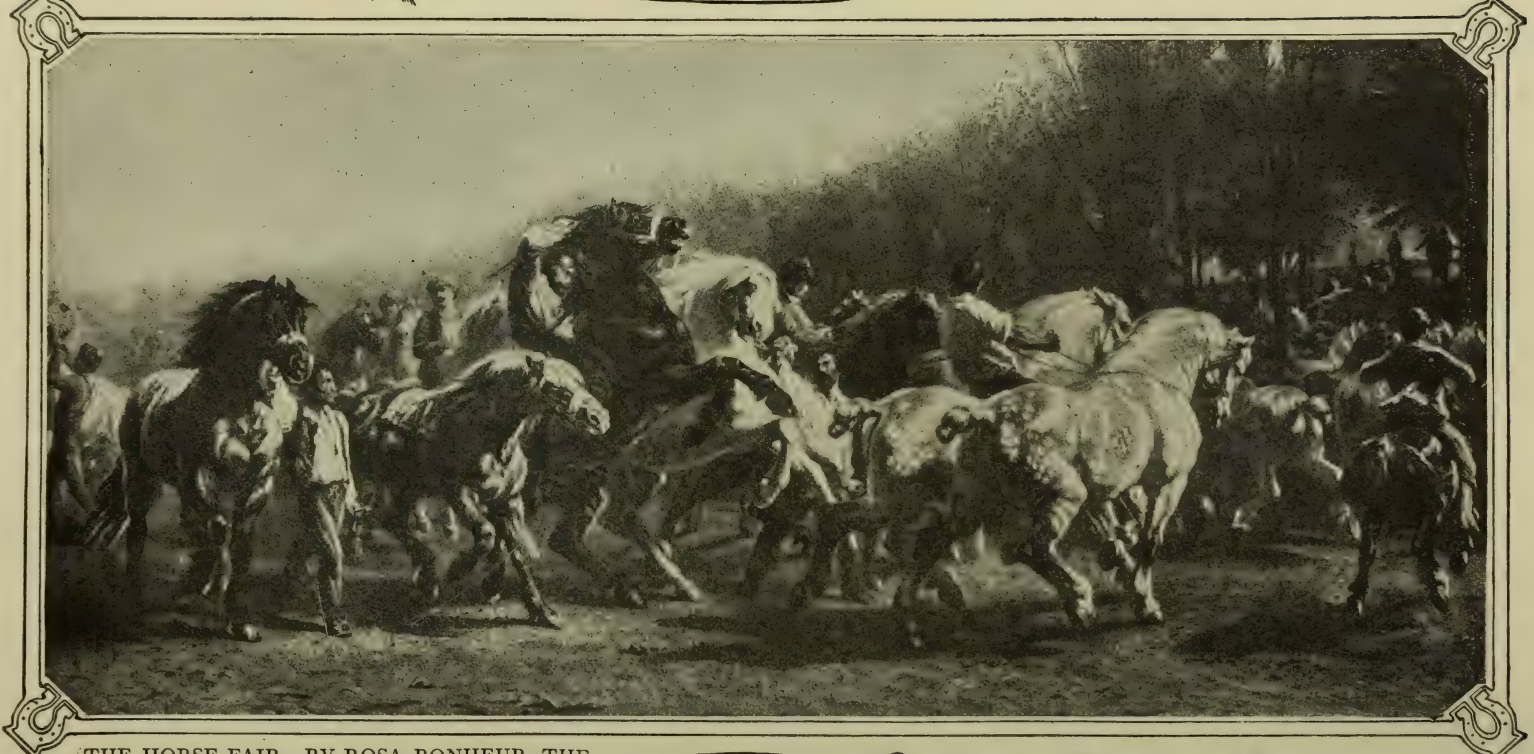
Bonghi, Ruggero (1826–95), Italian scholar, political writer, and statesman, was born at Naples, and took an active part in the political events of 1847–9. Between the years 1859–77 he held various chairs of philosophy, classics, and ancient history at Pavia, Turin, Florence, Milan, and Rome. In 1860 he entered Parliament, and was minister of education from 1874–6. Thereafter he devoted himself to literature. His numerous works include *Storia di Roma* (1884–6), *Storia dell' Europa durante la Rivoluzione Francese* (1890–4), various biographies (*Vita di Gesù*, 1890; *Arnaldo da Brescia*, 1884), translations of Plato, Aristotle, etc., and essays on contemporary politics. He was a regular contributor to the *Nuova Antologia.*

Bongo, a negro race in the Sudan, between the head-waters of the Bahr-el Ghazal and the Ubangi. They are of middle stature, strongly made, and have a reddish-brown skin. They exhibit some skill in the working of iron. See Schweinfürth's, *The Heart of Africa* (1878).

Bongo, isl., Cotabato prov., P. I., 10 m. off E. shore of Illana Bay, S. coast of Mindanao. It is small, densely wooded and reaches an altitude of 300 ft.

Bonham, tn., Tex., co. seat of Fannin co., 75 m. N.N.E. of Dallas, on the Mo., Kan., and Tex. and the Tex. and Pac. R. Rs. It is the seat of Carlton College (Christian) and Bonham Masonic Female institute. There are cotton-seed oil and flour mills, machine shops, cotton and furniture factories. Pop. (1910) 4,844.

Bonheur, Rosalie or Rosa (1822–99), French painter of animals, was born at Bordeaux, but early moved (1830) to Paris. Rosa's habit was to study animals not only in their anatomy, but also in their passions. With this object she frequented markets and slaughter-houses. She was eighteen when her first picture was exhibited at the Salon, and in 1848 she painted her famous *Attelage Nivernais*, now in the Luxembourg. After the exhibi-



THE HORSE FAIR. BY ROSA BONHEUR, THE
FAMOUS ANIMAL PAINTER.

tion of 1855 she rarely exhibited. The *Horse Fair* was painted in 1853; the original is in the Metropolitan Museum in New York City, and a replica in the London National Gallery. Her *Deer in the Forest* is also in the Metropolitan Museum in New York City, and her *Deer Drinking* in the New York Public Library. In 1865 the Cross of the Legion of Honor was conferred on her by the Empress Eugénie, who was at the time acting as Regent. She painted in Spain and Scotland, but her usual residence was near Fontainebleau. Many of her pictures are in England, four in the Wallace collection. Consult Roger-Miles' *Rosa Bonheur*, and Stranahan's *History of French Paintings*.

Boni, bō′nē, native state, Celebes, Dutch East Indies, in the southern part of the western peninsula; area about 2,000 square miles. The chief products are cassia, rice, sago, tobacco and cotton. The people, who are mostly Buginese, are skilful workers in gold and iron. The capital is Boni, on the eastern coast. Pop. about 200,000.

Boniface, bon′i-fās, the name of nine Popes. Boniface I., bishop of Rome (418–422), was a contemporary of St. Augustine, who dedicated to him his *Quatuor Libri contra Duas Epistolas Pelagianorum.*—Boniface III. was consecrated Pope in February, 607, and died in October of the same year. He obtained from the Emperor Phocas recognition of the headship of the church at Rome.—Boniface V. (619–625) enacted a decree by which churches became places of refuge for criminals. He did much for the Christianizing of England, and four of his letters relative thereto are reproduced in Bede's *Ecclesiastical History.*—Boniface VIII., Benedict Cajetan (1294–1303), was born in Anagni, a man of great ability. He strongly upheld the temporal as well as the spiritual power of Rome, and was involved in disputes with the Colonnas and Philip the Fair of France, whom he excommunicated. He was proceeding to interdict the whole of France when he was made prisoner at Anagni, and although released almost immediately by the populace, soon died of shock.—Boniface IX., Pietro Tomacelli (1389–1404), quarrelled with Richard of England regarding the collation of benefices. During the reign of Clement VII. he asserted his right to the Popedom, and held his court at Avignon. Consult McKilliam's *A Chronicle of the Popes.*

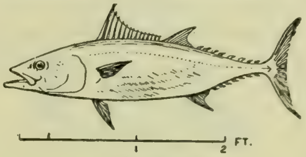
Boniface, St. (680–755), the monastic name of Winfried, archbishop, and the great 'Apostle of Germany,' a native of Crediton, Devonshire. Trained in Benedictine monasteries at Exeter and later at Nursling, in 710 he was ordained priest. In 718 he went to Rome, where he was commissioned by Gregory II. to the heathen nations of Germany, and labored as missionary for thirty years. He was consecrated to the bishopric in 723, and founded four cathedrals—Erfurt, Buraburg (near Fritzlar), Eichstatt, and Würzburg—and established episcopal sees at Freising, Passau, Regensburg, and other cities. Gregory III. appointed Boniface Archbishop and Primate of all Germany; he was chosen archbishop of Mainz in 746, but resigned the see in 754, in order to devote himself more fully to the evangelization of the heathen. During an open-air confirmation service in Friesland in 755, Boniface and his converts were massacred by the heathen. His remains were finally buried in Fulda, where he had founded the celebrated monastery. There is a Life of Boniface by Wilibald (in *Monumenta Germaniæ Scriptores*, vol. ii. 1829), and his *Letters* have been edited by Giles (1844) and Jaffé (1866).

Bonifacio, bō-nē-fä′chō, Strait of, a narrow, rocky passage, difficult of navigation, 7 miles wide, between Corsica and Sardinia.

Bon′ington, Richard Parkes (1801–28), English artist, was born near Nottingham. His youth was spent in Paris where he became a friend of Delacroix, and was deeply influenced by his great contemporary, Constable. He first exhibited at the Salon in 1822, and later painted in England and in Italy, but his work belongs to the French rather than to the British school. His landscapes (especially in watercolor) and his historical paintings are famous for their brilliancy of coloring. He also drew sketches for lithography, and sometimes drew on the stone itself. The National Gallery, London, has one painting; the South Kensington Museum, two landscapes in oil and seven drawings; the Wallace Collection has thirty-four oils and water-colors—a representative series of his historical and landscape work.

Bonin Islands, bō-nēn, a group of volcanic islands belonging to Japan. They form a part of the Magellan Archipelago, in the North Pacific, about 24° n. and 140° e., and are divided into four clusters—*viz.*, Coffin Island, Beechey Island (principal, Peel Island, with Port Lloyd, which has a good anchorage), Kater Island and adjacent rocks, and Parry Island. The European and Polynesian half-breeds, and the Japanese colonists who inhabit the group, catch turtle and sharks (for their fins and oil). The Japanese used them as a penal settlement from 1593 to 1725, and in 1876 took definite possession of them. Pop. about 6,000.

Bonito, bō-nē′to (*Thynnus pelamys*), a fish allied to the Mediterranean tunny, found abundantly in temperate and tropical seas. Like its ally the mackerel, it is an active, predaceous animal, its chief food being flying-fish. It is a fairly good food fish, but is not common in American markets.

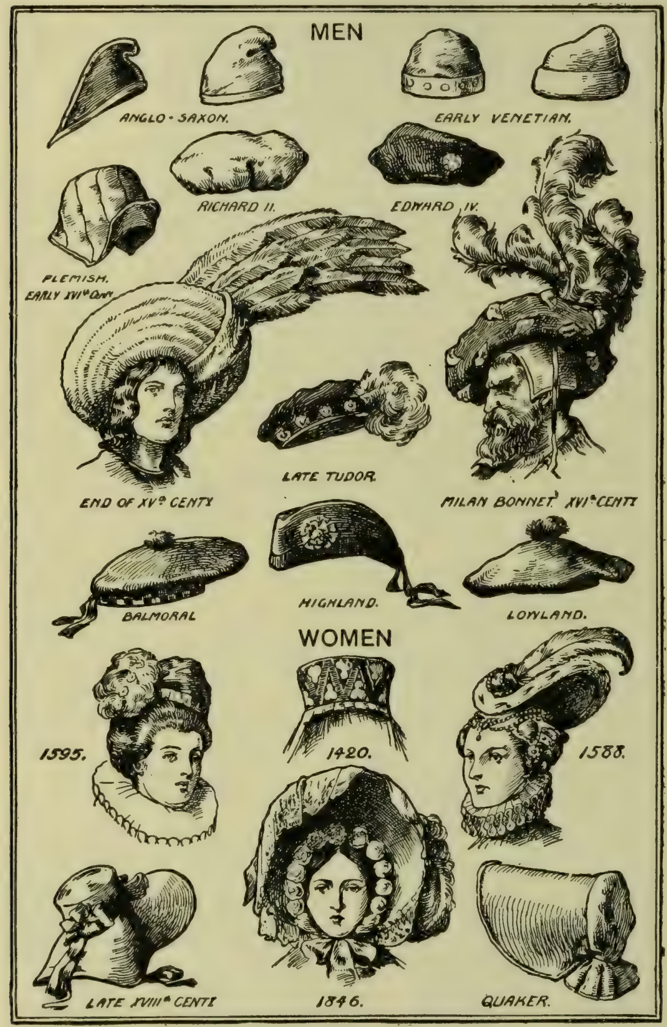


The Bonito

Bonivard, bō-nē-vär′, or Bonnivard, François de (1493–1570), the reputed original of Lord Byron's *Prisoner of Chillon*, was born at Seyssel of an ancient Savoyard family, and in 1510 succeeded his uncle as prior of the Cluniac monastery at Geneva. Owing to his hostility to the Duke of Savoy, he was seized in 1530, and spent six years in the castle of Chillon, during four of which he was underground. Released by the Bernese in 1536, when they wrested Vaud from Savoy, he returned to Geneva, and became a Protestant. In 1542 the city commissioned him to compile its history, a task which he completed in 1550. But Calvin found both style and matter wanting, so that the *Chroniques de Geneve* were never printed till 1831 (best ed. 1867, by Revilliod). The work is uncritical, diffuse, and biased.

Bonjem, small oasis, in the hinterland of Tripoli, North Africa, on the direct track between that town and Sokna, 150 miles north of Sokna. It contains Roman buildings in an excellent state of preservation.

Bonn, city, Germany, in the Rhine province, charmingly situated on the left bank of the Rhine; 21 miles southeast of Cologne by rail. The river is here crossed by a beautiful bridge, and the villas with their lovely gardens on the Rhine make an attractive picture. The most conspicuous building is the Münster, an example of late Romanesque architecture, completely restored since 1875. Other noteworthy structures and institutions are the university (1818), in the lower part of the town; the provincial (Rhenish) museum, built 1889–93 and containing a good collection of antiquities and a picture gallery; the museum of the Academy of Arts; the municipal museum; the castle of Poppelsdorf, which contains the natural history collections of the university; Beethoven's house, since 1889 a museum; and the house of Arndt. Behind the town rises the hill Kreuzberg (410 feet), crowned by a famous pilgrimage church. In addition to the university, Bonn has an agricultural high school, a botanical garden and other educational institutions. It is an episcopal see of the Old Catholics.



Bonnets

Bonn is the *Castra Bonnensia* of Tacitus, one of the chief Roman camps on the Rhine. It was almost destroyed by the Elector Frederick III. of Brandenburg in 1689, and was besieged by Marlborough in the war of the Spanish Succession. Its fortifications were demolished in 1717. At the close of the Great War, in accordance with the Treaty of Versailles, from 1918 to 1926 it was occupied first by British, and later by French troops. Pop. (1900) 50,736; (1919) 91,910.

Bonnat, bō-nä′, LEON JOSEPH FLORENTIN (1833–1922), eminent and powerful French painter was born in Bayonne. He studied with Madrazo in Madrid and began to exhibit in the Salon in 1857, his genius declaring itself in the *Pilgrims at the Foot of the Statue of St. Peter* (1864). His *Assumption* (1869) is in Bayonne, his *St. Vincent de Paul taking the Place of a Galley Slave* (1866) in St. Nicholas des Champs, his *Christ on the Cross* (1874) in the Palais de Justice, Paris, and his *Martyrdom of St. Denis* in the Pantheon. But his fame rests chiefly on his portraits, remarkable for energy and keen insight. Among his subjects were Victor Hugo, Thiers (Louvre), Puvis de Chevannes, Pasteur, Dumas, Renan, Ferry, Grévy, and Cardinal Lavigerie (Luxembourg). His work is well known in America, as he painted the portraits of a number of Americans, among them a portrait of John Taylor Johnston, a founder of the Metropolitan Museum of Art, New York, in which this painting may be seen. Bonnat's *Italian Girl* and the *Arab Plucking a Thorn from his Foot* are in private collections in New York City.

Bonner, EDMUND (?1500–69), bishop of London, who, through the patronage of Cardinal Wolsey, came to be of great service to Henry VIII. in his controversy with the Pope (1532–4). In 1539 he was elected bishop of London. Under Henry he maintained the principle of royal supremacy; but under Edward VI. he resisted the claim of the Privy Council to uncontrolled authority in church and state, and was confined in the Marshalsea prison from 1549 to 1553. On the accession of Queen Mary he was restored to his bishopric. Refusing to take the oath of supremacy (1559) to Elizabeth, he was again sent to the Marshalsea, where he died.

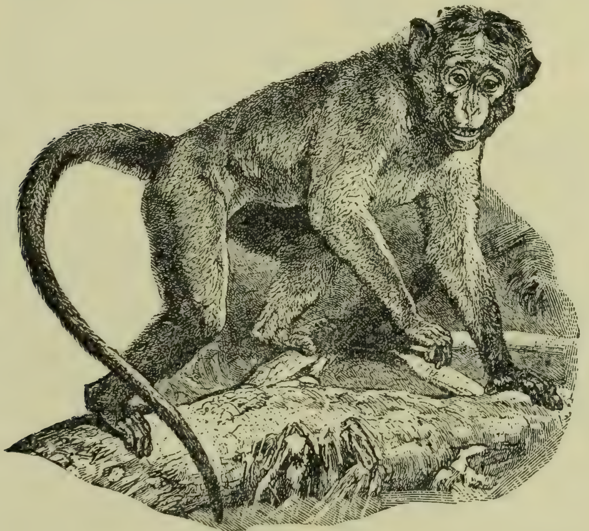
Bonner, ROBERT (1824–99), American publisher, was born near Londonderry, Ireland. He went to the United States in 1839, and began work in Hartford, Conn., as an apprentice in the *Courant* office. Removing to New York City in 1844, he became correspondent for out of town papers while working as printer and proof-reader, and in 1851 he bought the *Merchants' Ledger*, a financial paper, to which he added literary material. He changed its name to the *New York Ledger* (1855), engaged popular writers at enormous prices, advertised in extensive and startling ways, and maintained its record as the most popular weekly in the United States until his retirement in 1887. He took great interest in fast horses, of which he acquired a notable list—among them Maud S. and Sunol—owning about fifty at his death.

Bonnet, a headdress of women worn out of doors, distinguished from a hat mainly by the want of a brim, and by its covering no part of the forehead. The earliest head gear of the women of Great Britain was a felt or woollen cap called *hæt*, worn by the higher class of Anglo-Saxons. This was superseded by a hood or veil, which lasted till the reign of Edward III., when hats first became general; but with the accession of Richard II. they were discarded in favor of colored hoods. Velvet headdresses were usual in the reign of Henry VIII.; French caps were fashionable in the reign of Elizabeth, who introduced the ermine bonnet, which was 'forbidden to all but gentlewomen born.' Since that time there have been as many changes in the style and shape of bonnets as in other articles of wearing apparel. The bonnet, however, has been gradually superseded by the hat in England and America, although there are spasmodic attempts to revive it in its most picturesque forms. The bonnet is still quite generally worn with a veil as a symbol of mourning, especially by widows, and forms a distinctive part of the costume of certain classes, such as the Quakers, and of sisterhoods, as nuns and deaconesses.

The term bonnet is applied also to a headdress for men and boys, usually soft, and distinguished from the hat by the absence of brim. The bonnet has been retained in Scotland, and is represented by three types: the Lowland broad bonnet, the balmoral, and the glengarry. The balmoral and glengarry are worn as a part of the undress uniform of the Scottish regiments.

Bonnet, bo-nā', CHARLES DE (1720–93), Swiss naturalist, was the son of a French family settled at Geneva. His first important work was the *Traité d'insectologie* (1745), which was permeated by the philosophical idea, then so powerful at Geneva, of the interdependence of all parts of the universe, physical and moral. In 1754 appeared his *Recherches sur l'usage des feuilles dans les plantes*, a treatise on vegetable physiology, followed by *Essai de psychologie* (1755), in which he sought to show the links between the moral and physical world, and *Considerations sur les corps organisés* (1762), Bonnet's teaching is most perfectly summed up in his *Contemplations de la nature* (1764)—of which it has been said that it might have been called the *Esprit de la nature*—and in his *Palingénésie philosophique* (1769–70), dealing with the immortality of all men and animals. He was strongly opposed to Voltaire and Rousseau. Consult *Mémoire* by Trembley (1794), and *Life* by the Duc de Caraman.

Bonnet Monkey (*Macacus sinicus*), a species of Old World monkey found in Southern India, so called from a curious crest of hair standing erect on the crown of its head. It is very docile and is often kept in captivity as a pet.

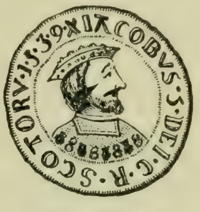


Bonnet Monkey

Bonnet Piece, a gold coin issued in 1539 and 1540, during the reign of James V. of Scotland. The coin is so called because the head of the King is adorned with a bonnet instead of a crown. It weighed 88½ grains and specimens are of great value to the antiquary, having sold as high as £20 10s.

Bonnet Rouge, the French liberty cap (q. v.).

Bonneval, bon'val', CLAUDE ALEXANDRE, COMTE DE (1675–1747), French soldier and adventurer, was born in Limousin of noble ancestry. After serving with distinction in Italy and the Netherlands, he was court-martialled for insolence and fled to Germany. He obtained a commission in the Austrian army and fought against his native country (1706–12) and under Prince Eugene against Turkey, (1716–17). For insulting conduct to the Prince he was subsequently sent to the Netherlands; there he was again dismissed for insolence and went to Turkey, where he became an officer in the Turkish army under the name of Achmed Pasha. He served successfully in the war against Russia and was made governor of Chios, but again his quarrelsome disposition brought him into disrepute; he was recalled and died in Constantinople.



Bonnet Piece

Bonne'ville, BENJAMIN L. E. (1795–1878), American army officer and explorer, was born in France. He went to New York as a boy, entered the U. S. Military Academy at West Point, and was graduated in 1815. In 1820 he constructed a military road in Mississippi and from 1831 to 1836 was engaged in explorations in the Rocky Mountains and California. He was promoted major in 1845 and fought through the Mexican War, taking part in many important engagements and being brevetted lieutenant-colonel for gallant service. He was made colonel in 1855, commanded the Gila expedition in 1857, and was retired for disability in 1861. During the Civil War he served as superintendent of recruiting in Missouri and in 1865 was brevetted brigadier-general for long and faithful service.

Bonneville, LAKE, an extinct glacial lake of the United States, of the Pleistocene period, occupying the northwestern part of the Great Basin known as the Utah Basin. It was formerly about 346 miles long, 145 miles wide, 1050 feet deep and covered an area of 17,500 square miles, but is now a flat plain with the shallow Great Salt Lake resting on its surface.

Bon'ney, THOMAS GEORGE (1833–1923), English geologist, was born in Rugeley, and was educated at St. John's College, Cambridge. In 1877 he was made professor of geology at University College, London, a post which he held until 1901, when he was created professor emeritus. He was president of the Geological Society (1884–5); Hulsean (1884), Boyle (1890–2), and Rede (1892) lecturer in Cambridge University. He served as vice-president of the Royal Society in 1899, and as president of the British Association in 1910–11. Among his works are: *The Alpine Regions* (1868); *The Story of our Planet* (1893); *Charles Lyell and Modern Geology* (1895); *Volcanoes* (1898); *The Building of the Alps* (1912); *The Present Relations of Science and Religion* (1913); *Memories of a Long Life* (1922).

Bonnie Blue Flag, a Confederate war song said to have been written by Henry McCarthy, member of a negro minstrel troupe and first sung at the Mississippi Convention which passed the act of secession.

Bon'ny, town on the southern coast of the British colony and protectorate of Nigeria, on the west coast of Africa; 80 miles east of the mouth of the Niger. It exports palm oil. Pop. about 7,000.

Bonny, river, one of the east mouths of the Niger, falling into the Bight of Biafra; formerly a notorious haunt of slave traders.

Bonomi, bō-nō'mi, GIUSEPPE, or JOSEPH (1739–1808), British architect, was born of Italian parents in Rome, and settled in England in 1767. His designs were chiefly in the style of Grecian architecture. His most celebrated buildings are the Italian villa at Roseneath in Dumbartonshire, Langford Hall in Shropshire, and Dale Park in Sussex. He was elected an associate of the Royal Academy in 1789.

Bononia, ancient Latin name of BOLOGNA (q. v.).

Bonpland, bôn plän', AIMÉ JACQUES ALEXANDRE (1773–1858), French naturalist, whose real name was GOUJAND, was born in La Rochelle. He travelled with Alexander von Humboldt in America (1799–1804), and was director of the gardens of Josephine at Malmaison(1805–14). Having been appointed professor of natural history at Buenos Aires in 1818, he was seized by Francia, dictator of Paraguay, while engaged in scientific work on the Paraná, and held a prisoner for eight years (1821–9). After his release he devoted himself to agriculture, first in Brazil and later in Argentina. His works include *Plantes equinoxiales* (2 vols. 1805, with 140 plates) and *Monographie des Mélastomacées* (2 vols. 1806, with 120 plates). Consult Brunel's *A. Bonpland.*

Bon'sal, STEPHEN (1865–), American newspaper correspondent, was born in Baltimore, Md. He was educated at St. Paul's School, Concord, N. H., and in Heidelberg, Bonn, and Vienna. He was special correspondent of the New York *Herald* during the Bulgarian-Servian War, the Macedonian uprising, the Chino-Japanese War, the Cuban insurrection, the Spanish-American War, and the China relief expedition; travelled for that paper in the Balkans, Albania, Macedonia, and Russia, 1904–7; visited South America and the West Indies in 1908; and in 1910–11 went to Mexico for the New York *Times.* From 1891 to 1896 he was in the U. S. diplomatic service in China, Japan, Spain, and Korea; in 1913 was appointed secretary to Governor-General Harrison of the Philippine Islands; in 1914 was commissioner of public utilities in the Philippine Islands; in 1915 was with Hindenburg's army on the east front and in 1918 was with the A. E. F. in France. He is the author of *Morocco as It Is* (1892); *The Real Condition of Cuba* (1897); *The Fight for Santiago* (1899); *The Golden Horse Shoe* (1900); *The American Mediterranean* (1912), and many magazine articles.

Bonsignori, bon-sē-nyō'rē, or BUONSIGNORI, FRANCESCO (1455–1519), Italian artist, was born in Verona, and lived there until he was thirty-two, when he went to Mantua and came under the influence of Mantegna. Marchese Gonzaga became his patron and retained him in his service until his death. Bonsignori was especially successful in historical subjects and as a painter ot animals. His best works include *St. Louis and St. Bernandino,* in Milan; *March to Calvary,* in Mantua; *Portrait of a Venetian Senator,* in the National Gallery, London; *Christ Carrying the Cross,* in the Doria Gallery, Rome, and *Madonna and Saints,* in Verona.

Bonstetten, bon'stet-*e*n, KARL VICTOR VON (1745–1832), Swiss littérateur, a scion of one of the great patrician families of Bern, was profoundly influenced by Rousseau. Later he visited England, and was a friend of the poet Gray. In 1803 he settled at Geneva, where he associated with Madame de Stäel and the historians of Switzerland, Johannes von Müller and Zschokke. His most famous work is *L'Homme du Midi et l'Homme du Nord* (1824), one of the earliest treatises on the influence of climate on the characters of various peoples—the south, in his view, being far inferior to the north. Consult his *Souvenirs* (1831) and biographies by Steinlen (in French), Morel (in German), and R. Willy.

Bon'tebok (*Bubalis pygargus,*) a species of antelope closely allied to the hartebeest (q. v.), but smaller and characterized by a broad white band down the middle of the face, and by white patches on the hind quarters.

Bontuku. See BONDUKU.

Bonus, an allowance in addition to that which is formally due. The term is applied to an extra payment of earnings made to holders of corporate shares in addition to the regular dividend, though in the United States this is more frequently called an extra dividend. It usually arises out of the undivided profits of former years, or is occasioned by exceptional transactions involving a large profit. In such cases the directors are unwilling to create a precedent by raising the nominal dividend. Special inducements in the form of money or stock offered security holders to induce them to exchange their securities for others are also called bonuses.

The bonus given by an insurance company is an addition made to the amount insured under a life policy. The amount is determined by the profits of the company as ascertained by periodical valuation. In mutual companies in the United States such a payment, if it accrues annually, is known as a dividend.

In industry the term bonus designates an extra payment made to employees as a reward for increased efficiency and effort, with the object of sharing with the workers the increased results of their industry. Bonuses may be based on economies effected, as in the use of coal, gas, or electricity; on length of service; on the quality or quantity of work produced; and on savings in the cost of production. In cases where neither the production of the individual nor the plant can be measured the bonus may be based on the success of the business as a whole. Such a bonus plan is often adopted by large banking houses, and the bonus is frequently given at the holiday season.

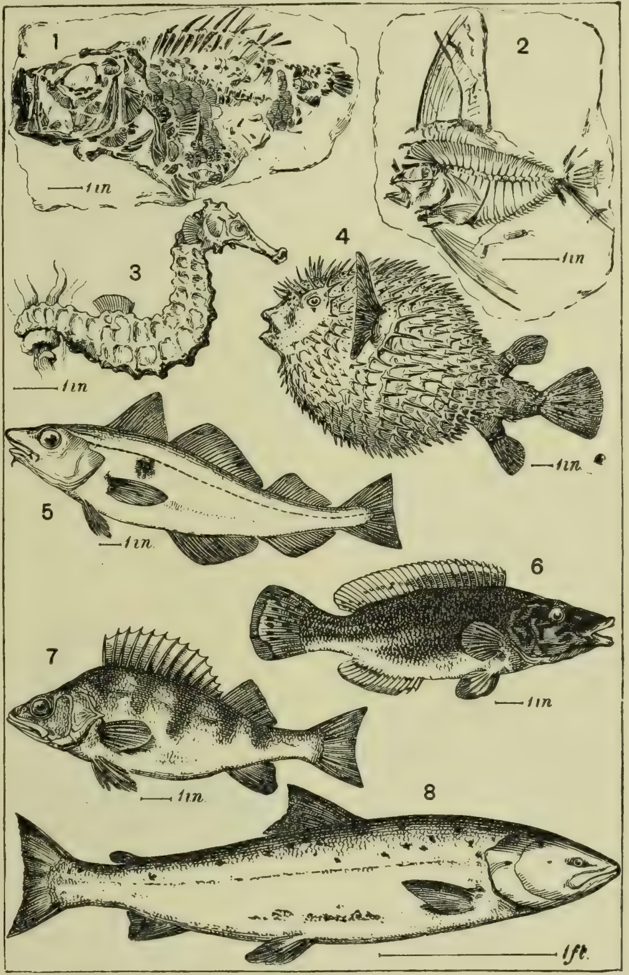
Like profit-sharing (q. v.), the bonus system is not coöperative in character; the establishment of the system and the control of the industry resting entirely with the employer. The chief advantages of the system are that it develops more accurate rewards for actual work done; encourages individual interest and initiative; helps to eliminate errors and waste, and tends to increase production and improve its quality. The disadvantages are chiefly those arising from practical difficulties in operation; carelessly administered bonus schedules give rise to unfairness and dissatisfaction, and interest, at first strong, tends to wane as the bonus becomes an old story.

Labor unions are often suspicious of bonus plans as expedients to outwit them; and occasionally employers use the bonus as a pretext for reducing costs and crowding the workers.

Bonus, Soldiers', compensation granted to ex-soldiers at the conclusion of a war, without regard as to whether or not they incurred any disability. In the United States, ten years after the close of the Civil War, President Grant vetoed a bill to pay a bonus to the troops he had led in battle, and it was not until over forty years after the close of that war that any able-bodied veteran received a bonus or a pension, and not until 1920 did an able-bodied veteran of the Civil War receive a pension or bonus solely on account of having served in the war. (See PENSIONS.)

At the close of the Great War a Federal bonus of $60 was awarded to every United States soldier upon his discharge from service. About 1920 a determined movement was undertaken for the payment of a further bonus to every man in the United States who had served in the War, the payment to be received under various options, as cash payments, certificate plans, farm, home and land settlements, and vocational training. A bonus bill passed by the House of Representatives and the Senate on Sept. 16, 1922, was vetoed by President Harding (Sept. 19) on the particular ground that it provided no funds for the enormous expenditure involved. On May 3, 1924, a second bonus bill was passed by the House of Representatives and the Senate; it was vetoed by President Coolidge on May 15 on the ground that it was unnecessary and uneconomical, but on May 19 it was passed over the veto by the Senate after having been again passed by the House on May 17. The main features of the bill are as follows: Men who served less than sixty days receive nothing in addition to the $60 which they received upon discharge. Those who served between 60 and 110 days receive a cash payment of $1.00 for each day served in excess of 60. Other veterans receive twenty-year endowment insurance policies, the value of the policy being determined by length of service, and whether this was overseas or at home. The average policy amounts to about $960. All ex-soldiers up to the grade of captain in the army and lieutenant in the navy are eligible, and dependents of dead veterans may receive their bonus. The lowest estimate of the cost to the nation is $2,000,000,000 spread over a period of twenty years.

A considerable number of the States also made provision for the payment of bonuses to their ex-service men. In 1924 the following States were paying such a bonus: Illinois, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Rhode Island, South Dakota, Vermont, Washington, and Wisconsin. Colorado and Pennsylvania had voted a bond issue for a bonus, but it had not then been voted on by the people. California, Connecticut, Nevada, Utah, and Wyoming had enacted various measures of relief instead of a cash bonus.



Bony Fishes

1. Hoplopteryx Lewesiensis (fossil). 2. Semiophorus velifer (fossil). 3. Sea-horse. 4. Globe fish. 5. Haddock. 6. Wrasse. 7. Perch. 8. Salmon.

In *Great Britain* gratuities to non-commissioned officers and men who served in the Great War were paid on demobilization. They were based on length and nature of service from Aug. 4, 1914, to the time of discharge. For men who were in overseas service the scale was as follows: Warrant officer 1st class £15, warrant officer 2nd class £12, sergeant £8, corporal £6 and private £5, for the first year, with 10s. for each succeeding month. For the men in home service the scale was the same for the first year's service, but 5s. instead of 10s. for each additional month.

The *Canadian* government passed a law in December, 1918, establishing a 'war gratuity,' applying to all officers, non-commissioned officers, and men of the Canadian land and naval forces. This act provided for a sliding scale of payment according to length and place of service, and based on payment at service rates, as if the man had continued to serve for a minimum period of 31 or a maximum of 183 days after receiving his honorable discharge. There are minimum payment clauses which provide that $70 is the smallest monthly allowance when a soldier has no dependents and $100 when he has dependents. The maximum period of payment is six months. Men serving three years, part overseas and in the actual theatre of war, receive a gratuity on the basis of 183 days' extra service; those serving three years in Canadian service, on a basis of 92 days; two years, and less than three, part or all overseas, on a basis of 153 days' extra service; two years' Canadian service, on a basis of 61 days; one year's service and less than two, part or all overseas, on a basis of 122 days' extra service; one year's Canadian service, on a basis of 31 days; those serving less than one year, part or all overseas, on a basis of 92 days' extra service.

Recent estimates of the bonuses paid by the various countries are as follows: Great Britain, $275,910,000; Canada, $147,600,000; Australia, $105,000,000; New Zealand, $18,290,000; France, $372,271,000; Belgium, $10,592,000.

Bonvalot, bôn'va'lō', PIERRE GABRIEL (1853–), French traveller and explorer, was born in Epagne, Aube. He accompanied G. Capus, in 1882, on a trip through Central Asia and Turkestan, followed by a second journey (1885–7) through Persia and the Pamirs. In 1889–90 he went with Prince Henri of Orleans on an expedition from Siberia to Tonkin, and in 1897 he was sent on a government mission to Ethiopia. He made another trip to Central Asia in 1900. His published accounts of his travels include *En Asie Centrale: I. De Moscou en Bactriane* (1884), and *II. Du Kohistan a la Caspienne* (1885); *De Paris au Tonkin* (1892); *L'Asie inconnue* (1896); *Une lourde tâche* (1913).

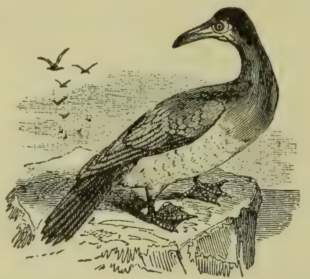
Bonvin, bôn-vaṅ', FRANÇOIS SAINT (1817–87), French painter and etcher, was born in Vaugirad. He treated lamplight effects with great success, notably in *A Woman Eating* (1848), *The Etcher* (1873), and in the water-color drawing *The Woman Watching* (1877). His subjects are interiors, still life, and figures, studied with great refinement and realism. Most of his work belongs to private owners, but the museums of Rodez, Niort, and Arras have fine examples; and he is represented in the Luxembourg at Paris by *The Servant at the Fountain* and *The Refectory*.

Bony Fishes, or TELEOSTEANS, an important order of fishes, including the vast majority of living forms. Since their first appearance, apparently in Jurassic times, they have increased in numbers until at the close of the secondary epoch they acquired the numerical superiority which they have never since lost. Ganoids and teleosteans are very closely related, and it is believed that the bony pike is the nearest living representative of the stock from which the latter arose. As special teleostean characters, are to be noted the soft scales, the completely bony skeleton, the usually homocercal or even-lobed tail, the swim-bladder, the absence of a spiral valve in the intestine, the existence of an anus instead of a common opening for food-canal and urino-genital organs, together with some less obvious anatomical peculiarities. See illustration on page 191 B.

Bony Pike. See GAR-PIKE.

Bonze, bonz *or* bon'ze, a member of a Buddhist fraternity; but the name is generally applied to any Asiatic monk or priest. It comes from a Japanese pronunciation of *fan sung*, which means an ordinary member of the assembly (monastery, etc.).

Booby, a name applied to those species of the bird genus Sula in which the whole of the lower jaw and throat is bare of feathers. They differ from the closely allied gannet in this character, and also in breeding in trees instead of upon rocks, and in being confined to warm climates. They are large birds, from twenty-eight to thirty inches in length, with long pointed wings and a long wedge-shaped tail of twelve to eighteen feathers. Most of the species are white except the wings and tail, which are black or dusky. Their food consists entirely of fish, especially herrings. They owe their common name to their seeming stupidity in allowing themselves to be caught by hand. Common forms are *S. cyanops*, the Blue-faced Booby, from the South Pacific, which closely resembles a gannet in appearance; the dark brown *S. leucogaster*, found in the tropical parts of the great oceans; and *S. piscator*, the Red-footed Booby.



Booby

Booby Island, small, rocky island, dangerous to the navigation of Torres Strait, Queensland, Australia.

Book (O. E. *bóc*), originally a writing-tablet, or board of beechwood; then any written document, more especially a charter or legal deed; a treatise or series of treatises written or printed on a number of leaves of paper or other material fastened together at the back and in some kind of binding; by transference, the literary or other contents thus preserved. An unbound book of less than one hundred pages is commonly called a pamphlet. Literary manuscripts of antiquity are spoken of as books when they are written on sheets of paper or vellum, or any substitutes for these, fastened and bound as already described. Previous to the introduction of this book form, literary works written on various materials, as bark, papyrus, parchment, paper, or skins, were put together in any portable form, commonly in rolls made by gluing together pieces of papyrus or vellum, or the separate leaves were strung or hinged together. Specimens of Egyptian papyrus rolls still exist, extending to upwards of 20 and even 40 yards, but the great inconvenience of consulting such enormous scrolls made it more usual to break up any lengthy production into sections, each on a separate roll. These are described under MANUSCRIPTS; see also BOOKBINDING. In ancient Assyria the equivalents of books were the clay tablets inscribed with cuneiform texts, and hardened, for preservation, by baking (see CUNEIFORM).

The earliest printed books were formed of leaves of parchment or of paper laboriously printed from xylographic plates, that is, plates of wood, on which an engraver had cut in relief the letters and figures of the text. The so-called block books were thus printed. Possibly from the occasional necessity of cutting a single letter to correct an error on the block may have sprung the pivotal idea of the art of book-making, the movable character for each letter. The *Biblia Pauperum* and *Ars Moriendi* are among the best specimens of block-books.

The earliest books printed from movable type imitated closely the manuscripts which they quickly superseded; the forms of the types were copied from the Gothic or blackletter characters in which

Bibles, psalters and missals were then written by professional copyists, the arrangement being generally the same. Thus the earliest books have no title page, the place of printing or publication, name of printer or publisher, and date of issue, being either withheld altogether or placed in a colophon or closing paragraph, such as author or copyist had been wont to write at the end of his manuscript. The Latin Bible, known as the Mazarin or Gutenberg Bible, printed at Mainz about 1455, has no colophon; that in the Psalter of 1457 has been translated: 'The present book of Psalms adorned with beauty of capitals, and sufficiently marked out with rubrics, has been thus fashioned by an ingenious invention of printing and stamping, and to the worship of God diligently brought to completion, by Johann Fust, a citizen of Mainz, and Peter Schöffer of Gernsheim, in the year of our Lord, 1457, on the Vigil of the Feast of the Assumption.'

In 1470 Arnold Therhoernen at Cologne printed on a separate leaf a nine-line paragraph containing the title of a Latin sermon and its date; fifteen years later title pages had become common, though the two earliest English examples, that of *A Passing gode lityll boke necessarye and behovefull agenst the Pestilens*, printed by Machlinia, and of *The Chastysynge of Goddes Chyldern*, issued from Caxton's office probably after his death, both date from about 1490–1. For more than a century after this the colophon struggled with the title page for the right of giving the fullest information about the book. Both colophons and (when they came into use) title pages were frequently decorated with the mark or device of the printer, and subsequently of the publisher. The earliest printers' device is the two shields of Fust and Schöffer in the Mainz Bible of 1462; but the use of such devices spread less quickly in Germany than in Italy and France, in both of which countries they attained great beauty, the Italian designs being mostly conventional, while the French often introduce the figure of the printer's patron saint, the arms of the town, or the sign of his house. When not decorated by a device, title pages in the 16th century often displayed a woodcut illustration, and in the 17th the entire title page was frequently engraved on copper.

The writers of MSS. made up their books in quires or gatherings of four to six sheets of paper or vellum, folded once and placed one within the other, forming sections of 8 to 12 leaves. These sections correspond to the folded sheets of the modern book. To aid the binder in arranging they marked the first leaf of the successive sections with the letters of the alphabet, further indicating the order of the leaves in the section by the addition of a number, aii, aiii, aiv, av, avi, on the following first leaf of each included sheet, according as the sections were quaternion (4 sheets), quinternion (5 sheets), or sextern (6 sheets). These letters were called signatures, a name now given to the entire folded sheet. The use of these signatures was introduced into printed books by John Koelhoff at Cologne in 1473, and has continued to the present time—the letters J and U, which had no separate existence in the 15th century, and W, which was not recognized in Roman founts, being still omitted. In early Italian books a summary of these signatures was often given in a register at the end of the book.

In most early books the leaves are left unnumbered, leaf numeration being first used by Arnold Therhoernen at Cologne in 1471, making its way gradually, and being slowly replaced by pagination during the 16th century. The preliminary leaves containing the author's preface or introduction, dedication, etc., were for a long time left unnumbered, and the use of Roman numerals for preliminaries and Arabic for the text is quite modern.

Very elaborate printed capitals in the proper sense of the word—*i.e.* large initial letters at the beginnings of chapters or sections of a book—were used in Fust and Schöffer's Psalter of 1457; but throughout the 15th century spaces were frequently left blank for them to be filled in by hand, a small letter being sometimes printed to guide the rubricator. The *De Regimine Principum* of Ægidius Columna, printed by G. Zainer at Augsburg in 1473, has not only printed capitals, large and small, but also headlines, chapter headings, and paragraph marks, all of which were frequently left to be added by hand in much later books. Decorative capitals became usual about 1490, and held their place in large books for rather over a century. The illustration of books forms the subject of a separate article.

Size of Books.—This is determined primarily by the number of times the sheets of paper used in a book are folded, and secondarily by the trade names of the sizes of paper used. In a folio the sheet is folded only once, to form two leaves; in a quarto twice, to form four; in an octavo four times, to form eight. Other recognized fold sizes are duodecimo (12°), sextodecimo (16°), octodecimo (18°, a French size), vigesimo-quarto (24°), trigesimo-secundo (32°), etc. When handmade papers are used, the true fold of a book, even when cut down in binding, can be told by the position of the wider waterlines—those in folios, octavos, 24mos, and 32mos being perpendicular; those in quartos, 12mos, and 16mos horizontal.

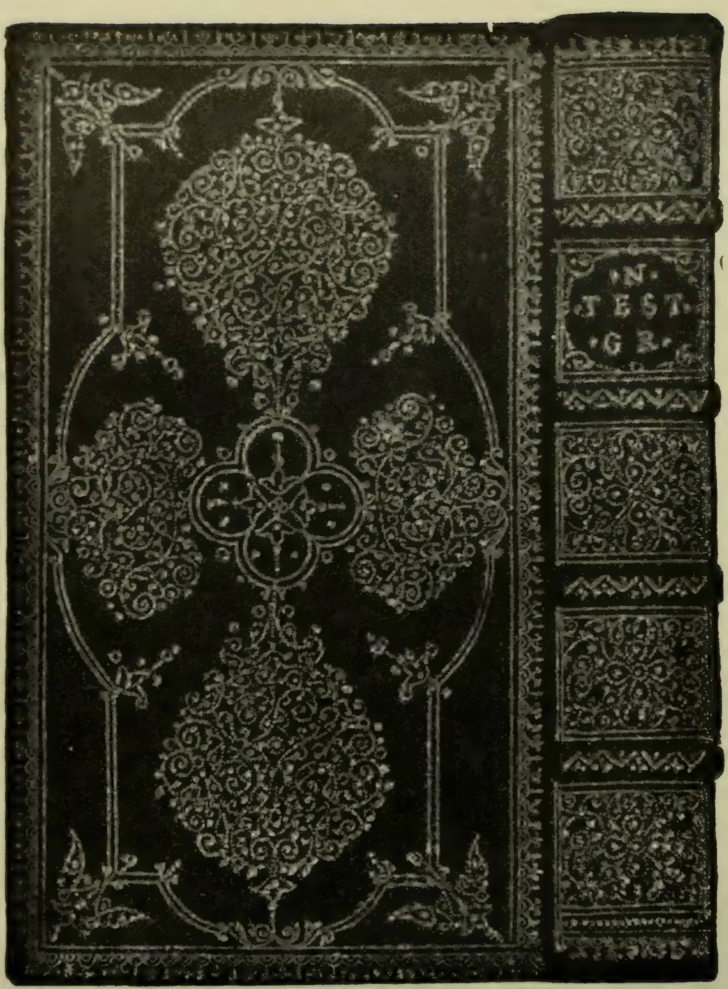
As sheets of paper from different makers varied greatly in dimensions, in order to meet the difficulty of determining the size of books from these fold numbers or symbols, the American Library Association in 1878 adopted the plan of indicating the size by giving the size from actual measurement of the outside height in centimetres. The size is indicated by a letter instead of a number; *e.g.*

SIZE LETTER	HEIGHT IN CTM.
T	12.5 to 15
S	15 " 17.5
D	17.5 " 20
O	20 " 25
Q	25 " 30
F	30 " 35

corresponding respectively to the fold symbols 24mo, 16mo, 12mo, 8vo, 4to and folio. The simplicity and exactness of this size notation have led to its general adoption in American libraries, and by the *Publishers' Weekly* office for all publications issued therefrom.

Early Books printed in America.—The first book printed in the American colonies was the *Bay Psalm Book*, compiled by Richard Mather, Thomas Welde, and John Eliot, the Indian missionary; it was printed in 1640 by Stephen Daye, of Cambridge, Mass. At the same place in 1661–3 was printed by Green and Johnson a still more celebrated book, *Eliot's Indian Bible*, the first Bible published in this country, and in the language of a nation no longer in existence. The credit of printing the first book in America is claimed for Juan Cromberger in Mexico, in 1539, based on a title given in a list published at Madrid in 1577. But a *Doctrina breve* of 1543, the fourth book known to have been printed in Mexico, is the earliest that can be located.

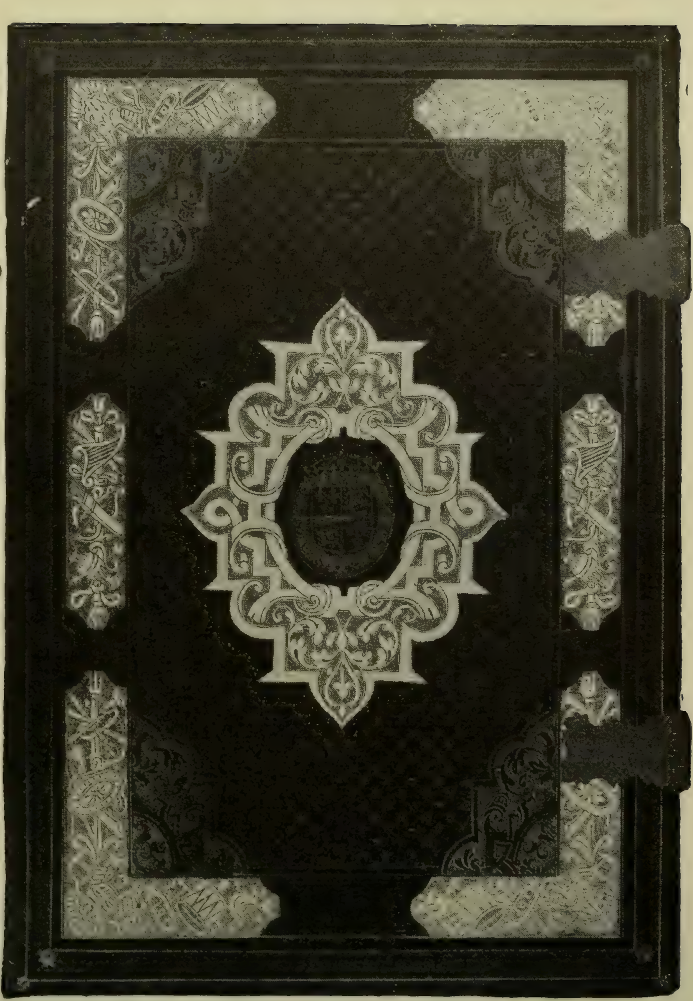
The book has always preserved for us a very exact image of the epoch in which it was written or printed, and a study of the manuscripts or printed books from different countries, showing the development of the caligraphic or typographic arts will also reveal the growth of literary taste during the same periods. It is a fact to be noted that the finest of the earliest books, printed in the blackest of ink on the whitest of vellum, or paper almost equal to vellum, have never been equalled by the modern bookmakers; their



NOVUM TESTAMENTUM GRÆCE. AMSTERODAMI, 1633.

Red Morocco. Bound by Le Gascon.

(By permission, from Fletcher's 'Foreign Bookbindings.')



FLORES HISTORIARUM PER MATTHÆUM WESTMONASTERIENSEM COLLECTI. LONDINI, 1570.

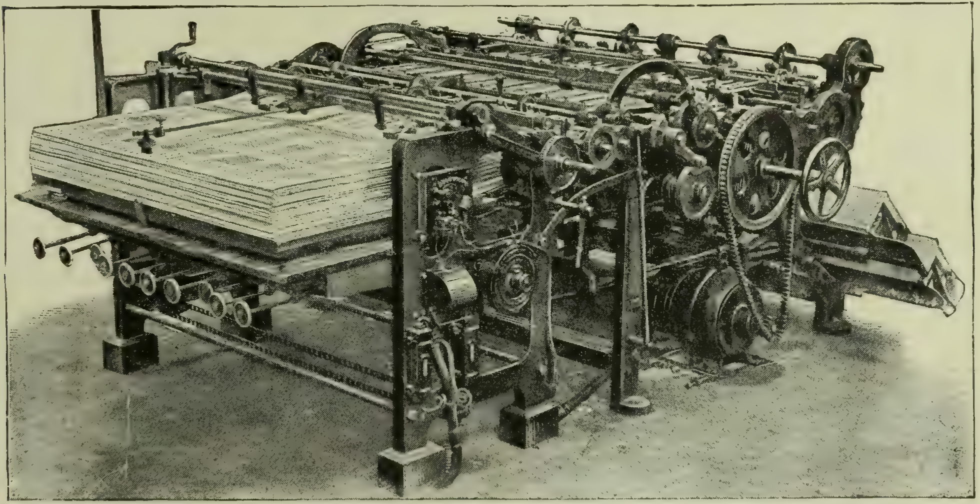
Presented by Archbishop Parker to Queen Elizabeth, whose initials and arms are inserted.

(By permission, from Fletcher's 'English Bookbindings.')

only rivals are the elegant manuscripts which they superseded.

See H. Bouchot's *The Book* (New York, 1889); G. H. Putnam's *Books and their Makers in the Middle Ages* (New York, 1896); E. G. Duff's *Early Printed Books* (London, 1893); *Library Journal* (New York, 1878); F. Saunders's *Story of some Famous Books* (New York, 1887); A. W. Pollard's *Last Words on the Hist. of the Title Page* (London, 1891).

Bookbinding. HISTORY.—Binding began when it became necessary to fasten together for preservation the inserted leaves or folded sheets of four, eight, twelve or more leaves of the written manuscripts of the monastic scribes. Threads were passed through the back folds of each section and around narrow bands of vellum or leather the ends of which were laced into the boards forming the sides of the books. In ordinary binding these boards of hard wood were covered with leather which was protected by metallic bosses, corner plates and other ornaments, and clasps. In the earliest English bindings which have come down to us from about the 10th century, the boards are covered with deerskin or other leather, on which numerous small stamps, from half an inch to an inch in size, containing figures of animals or conventional designs, have been impressed. By arranging these small stamps in circles, rectangles, and other patterns, the binders of Winchester, Durham, Oxford, and London, in the 11th and 12th centuries, produced excellent effects, and the English binders of this period were the best in Europe. Large panel stamps were subsequently used in France and the Low Countries, and were introduced into England in the 15th century. They are found on numerous books of the time of Henry VIII., some of them bearing the royal arms, others figures of saints or conventional designs. In the 12th and 14th centuries the boards of very valuable books, more especially copies of the gospels for use in church, were covered with carved ivory or metal, and frequently studded with gems. The famous 'Lindau Gospels' thus ornamented in gold and jewels, belonging to the Earl of Ashburnham, was sold to Mr. J. P. Morgan in 1901 for $50,000. Towards the end of the 15th century the use of gold leaf in the decoration of bindings was introduced into Venice from the East; and with it an Oriental style of ornamentation showing the Arabic or Saracenic origin of this kind of decoration. Aldus made use of an arabesque ornament of solid face, a style that still bears his name 'Aldine.' Later the tools were crossed or shaded with parallel lines and formed the style called 'azured.' Under the patronage of Jean Grolier (who became treasurer of the duchy of Milan in 1510), Tommaso Maioli, and other wealthy book-lovers, many beautifully-decorated bindings were produced in Italy in the first half of the 16th century, with gold-tooling in lines, straight and curved, worked into the geometrical figures preferred by Grolier, and the elaborate patterns of Maioli, with their azured and openwork arabesque ornamentation, of such exquisite design and workmanship as to command the admiration and imitation of the best workers of all succeeding periods. Contemporary with these we find in France the famous Lyonnese painted bindings. Later, on the return of Grolier to France under royal patronage, the French school of binding speedily attained excellence by the work of such artists as Nicolas and Clovis Eve (fl. 1560–90), with their elaborate gold-tooled framework interlacings, and compartments filled with laurel and palm branches, and graceful scrolls; Le Gascon (*c.* 1620), with still more delicate dotted-face gold lines and dentelle or lace-work patterns and borders; Du Seuil, Monnier, and the successive members of the families of Padeloup and Derôme, and continued pre-eminent till nearly the end of the 18th century. In Germany many good bindings in white pig-skin were executed in the 16th century, blind-stamped by means of small dies representing biblical, mythological, or classical subjects, portraits or purely conventional designs, sometimes dated, and used on books of all kinds without any reference to the fitness of the design to the contents of the book; here gold-tooling arrived late, and never developed any originality. In Holland, Le Gascon found imitators in Poncyn and Magnus of Amsterdam. In England, with the assistance of Italian workmen, Thomas Berthelet, printer and bookbinder to Henry VIII., turned out some excellent bindings; and, under the patronage of Archbishop Parker the workmen of John Day estab-



Quadruple Folding Machine, folding a sheet of sixty-four pages (four signatures) of this Encyclopædia.

lished a heavy and dignified English style, well suited to large folio volumes. Under both the Tudor and the Stuart kings various styles of embroidery were applied to bindings, the gaudy little prayer books in embroidered satin of the reign of Charles I. being quite inaccurately associated with the work done in the religious house maintained by John Ferrar and the Collets at Little Gidding. Under Charles II. the royal binder, Samuel Mearne, freely copied Le Gascon, his designs being often excellent. Their general effect is pleasing, especially when the tooling is combined with inlays of different colored leathers. From the frequent use of a design, the top and bottom of which dimly resemble a roof, the bindings of Mearne and his successors are often spoken of as forming the 'cottage' style. In the first half of the 18th century many handsome bindings in red morocco, with a centre ornament in gold tooling, were executed for Robert Hadley, Earl of Oxford, and during this century England took front rank for artistic finishing of books, due largely to the work of Roger Payne, which combined in high degree originality, fine taste, and consummate workmanship. During the 19th century binding all over Europe suffered from the slavish imitation of old designs, but in the latter half of the century, especially since the Paris Exposition of 1867, the binders of England and of France have put forth some excellent work. The workmanship of Hayday and Bedford surpasses that of Roger Payne, and the splendid tooling of Capé and Trautz excels in perfection of finish any of the work of their predecessors. The works of the French binders, Petit, Joly, Lortic, Marius Michel, and the exquisite inlays of Pagnant and Meunier are highly esteemed for originality and delicate finish, even though at times fantastic and bizarre in design.

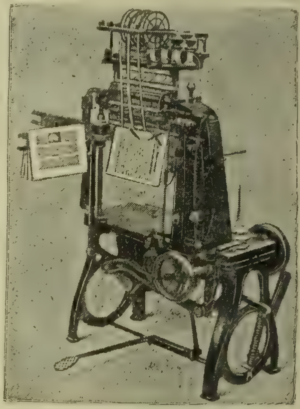
A collection of the best work done by American binders during the same period would more than hold its own in comparison with foreign work. Examples of finishing by F. Gilson show excellence of design and for perfect accuracy of execution are unexcelled. The highest praise has been given to Otto Zahn, of Memphis, and Stikeman, of New York, but to the late William Matthews must be assigned the first place in the ranks of American bookbinders.

MODERN INDUSTRY.—The requirements of modern publishing have made cheaper and speedier methods necessary, and practically every operation may now be performed by machinery. Modern bookbinders divide their work into two sections—'forwarding,' or preparing the book, and putting on the cover; and 'finishing,' or decorating the cover.

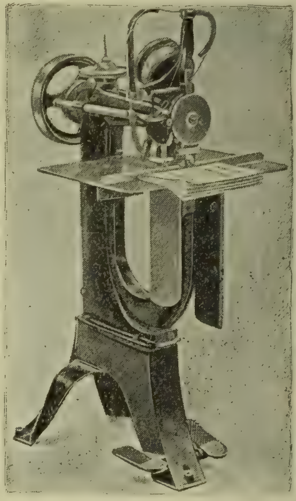
Forwarding includes the operations of folding, gathering, collating, sewing and papering, trimming, gluing, rounding and backing, casemaking and covering. Folding of small quantities is still done by hand. The printed sheets are folded once, twice, thrice, or four times, according to the number of pages in the sheet. The hand folder uses no tool except a small piece of wood or bone, like a paper-knife. Before a fold is made care is taken that the pages are placed exactly opposite each other, or 'in register.' The section of a book folded in each sheet is commonly known as a signature, and the usual signature contains sixteen pages; for thin papers, thirty-two pages. The technical name of each size of book is determined by the number of folds. (See article BOOK above.) Folding machines are now devised to make one fold (for a sheet of four pages), two folds (for eight pages), three folds (for sixteen pages), four folds (for thirty-two pages), and also to do the more unusual folds for twenty-four pages, forty-eight pages, etc. The simplest type of machine for ordinary bookwork makes three folds, and produces a folded signature of sixteen pages. To secure correct 'register,' the sheets are fed by the operator so that the edges are in contact with 'guides' at the front and side, or are 'pointed'—*i.e.* tiny holes, perforated in the sheet in the process of printing, are placed over steel points on the feeding-board of the folding machine. The feeding is now usually done by an automatic attachment to the folding machine. The most efficient of all bookfolding machines is the quadruple (an American invention), which folds a sheet of sixty-four pages, cutting it into four sections of sixteen pages, each of which is delivered into a separate trough at the rate of from forty to forty-five large sheets per minute.

Gathering.—The folded signatures must next be gathered in complete books. This operation is done either by hand or by gathering machines, which have long rows of boxes for the signatures, and moving fingers which take out one signature at a time. They deposit these in proper order on a moving band, and forty complete books can thus be gathered in a minute. Gathered books must next be *collated*—*i.e.* looked over to see that the sections are in their proper order.

Stitching. — Hand - sewing is done in frames across which are stretched, in a vertical position, the cords or tapes on which the books are to be sewn. Small holes are sawn in the backs of the signatures, and through these the sewer passes the needle in and out round the cords or tapes. It would be impossible to explain or illustrate all classes of book sewing machines, but it will suffice to give two illustrations of those most commonly used. The first is the machine generally used for bookwork. The operator feeds the signatures on a radial arm which carries them into the machine, where they are firmly sewed. The second machine illustrated is an example of the numerous wire-stitchers which cut off from a reel a small piece of wire, form it into a staple, force it through

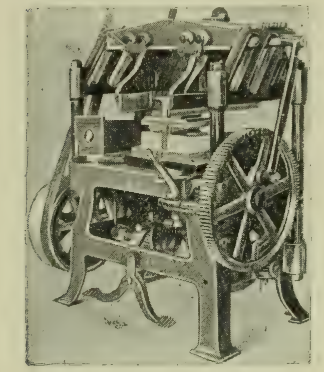


Book-sewing Machine.



Wire-stitching Machine.

the paper, and turn over the ends of the wire. These ingenious machines can wire-stitch a book one inch in thickness.



Guillotine with Two Knives.

End-papering.—At the front and back of the book a strong paper, called 'end-paper' or 'waste-paper,' is now fixed. By this the book will afterward be pasted to its cover.

Trimming.—After sewing, the books have their edges trimmed (unless bound with uncut edges) on a guillotine. The simplest form of guillotine is a metal table with guides to place the books in proper position, a press (platen) to hold them firmly, and a descending knife to cut the edges. In this form of machine books must be inserted three times to get their 'heads,' 'tails,' and 'fore-edge' cut. Other forms have been devised with either one or two knives in which the books are placed on turn-tables, all three edges being cut consecutively, without moving the books.

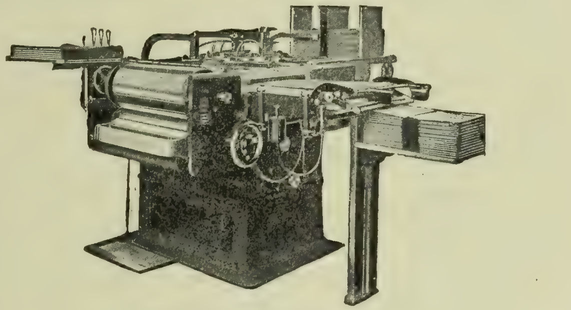
Gluing.—The trimmed books are now glued on the back with a brush, to harden them and make them more solid.

Rounding and Backing.—When the glue is dry, the books are ready for the next two operations—*viz.* rounding the backs, a term which explains itself; and 'backing'—*i.e.* making the little projections at the side against which the cover opens as on a hinge. These operations are done in small binderies by hammering the glued backs roughly into a curve, then fixing them in a vice and passing a roller over the backs. In large binderies the two operations are performed at once by a rounding and backing machine.

Lining.—The next operation is the pasting on of mull or paper, or both, to the rounded back to give additional strength to the book. When this is done the book is ready for *casing.*

Case-making.—In binding ordinary cloth books, the covers or 'cases' are made before they are attached to the books. The materials required are cotton cloth, straw boards for the sides, and thick paper to stiffen the back. All these are cut to the exact size required. The cloth is glued with a brush, the boards and stiff paper are laid on by gauges, and then the edges of the cloth are turned over, a piece being cut off each corner to prevent a thick fold. Case-making is now done in large binderies by machines, of which the one illustrated is most generally used. The operator feeds the cloth to guides. The machine glues it, places the boards and stiff paper in position, and completes the case.

Finishing the Case.—Modern cloth books must receive some ornament on the covers, and this is done either by the hand work already described or by machine-'blocking.' By this latter method metal stamps, on which the design for the back and sides is cut, either emboss the cover or print it with ink or gold. In the gold process, known as 'gold blocking,' leaves of very thin gold are laid on the covers at the spots where a gilt design is required; the design is then stamped in with a hot metal stamp, and the surplus gold leaf not impressed by the stamp is brushed off the cover.



Case-making Machine.

Casing.—The book being now ready for its cover, and the cover being prepared for the book, there remains only the operation of pasting the two together. After being pressed for a few hours, the book is ready for delivery.

It would be impossible to describe in detail the progress of many other classes of work which pass through binders' hands. A few words may, however, be added about some distinctive features of other work with which every reader is familiar.

Edges.—Ordinary cloth work has plain edges either trimmed, as already described, or 'deckle-edged'—*i.e.* rough and uncut—when an antique paper has been used. Very often, however, trimmed edges are dyed with red or some other color, or 'sprinkled' with spots of mixed colors. These colored edges, again, may be either dull or 'burnished' by hand.

Many fine books are bound with gilt edges or gilt tops. The books, after trimming, are fastened in a press; the edges are scraped smooth, and sized; gold leaf is then laid on, and when dry is burnished with a tool by hand till it shines brightly. In Bibles, etc., a color is washed over the edges before gilding, producing the beautiful 'red under gold' edges.

Leather Binding.—In the finest work, or when great strength is required, a leather cover is not completed separately from, but, as it were, built up round the book, and finished when attached to it. In recent years, however, leather bindings have become so common that most of the leather covers are now made and finished separately like cloth cases. In the old-fashioned way the leather cover adhered to the back of the book, but was made so supple that the book opened freely. In the more modern style of leather binding, as in ordinary cloth work, the back of the book and the back of the cover are not fixed together, and when the book is opened they curve in opposite directions and a hollow appears between them; hence the expression 'hollow back.' The cheapest leathers in use for bookbinding are split sheepskins (commonly known as 'skivers' or French moroccos). Next come sheepskins of the full thickness of the hide; then persians—the skins of Persian goats; and lastly fine moroccos. The persians, moroccos, and other fine leathers have beautiful natural grains, but the same appearance is given to both fine and common leathers by stamping them in a machine by a metal plate. (See LEATHER.)

Leather-bound books may be

roughly divided into (1) full leather or 'bound' books, in which the whole cover is leather; (2) 'half-bound' books, with leather back and corners, the rest of the cover being paper or cloth; and (3) 'limp' books. In the first two classes the basis of the cover is a stiff board; in the third the cover is made as flexible as possible. Bound and half-bound books are generally made with 'hollow backs,' but in limp leather bindings, which have recently become very popular in Dent's Temple Classics, Nelson's New Century Library, etc., the covers are always pasted to the backs of the books.

Bibles.—A very large proportion of leather binding is done for Bibles and Prayer Books. For an example of fine leather bindings done in large quantities at cheap prices, nothing is more wonderful than the beautiful flexible Bible work of Eyre and Spottiswoode and other Bible firms. Nearly all Bible work comes under the class of cased work, and the two prevalent styles are known as 'limp' (*i.e.* soft leather covers without flaps) and 'divinity circuit' or 'yapp' (*i.e.* soft covers with a projecting flap turned over to preserve the book). 'Bible work,' and especially Prayer Books, give great scope to the binder for introducing round corners, pretty gold lines, and ornaments both inside and outside the cover, and tasteful linings of paper or leather for the inside of the covers.

Stationer's Binding, or the manufacture of account books, etc., is a distinct branch. These books must be specially strong, and the covers are securely fastened to the books at an early stage, and completed while fixed to the books themselves.

A bibliography of works on binding is printed at the end of Miss S. T. Prideaux's *Historical Sketch of Bookbinding* (1893), itself an excellent work. Other good books are W. Matthews's *Modern Bookbinding practically considered* (1889); H. P. Horne's *The Binding of Books* (1894); W. Y. Fletcher's *Bookbinding in England and France* (1896); C. J. Davenport's *Royal English Bookbindings* (1896); and *English Embroidered Bookbinding* (1899). The best collections of colored illustrations of bindings are the *Catalogue of the Exhibition of Bookbindings at the Burlington Fine Arts Club* (1891); *Examples of Bookbindings* (1894); Fletcher's *English Bookbindings in the British Museum* (1895), and *Foreign Bookbindings in the British Museum* (1896). The technical processes of bookbinding are briefly described in Mr. Horne's book quoted above, and more fully in J. W. Zaehnsdorf's *The Art of Bookbinding* (1890), also in Douglas Cockerell's *Bookbinding and the Care of Books* (1902).

Book Clubs. Before the growth of circulating libraries clubs were formed in many country towns and districts for the purchase of the best popular books of the day, and their distribution among the members in rotation. At the end of the year the books purchased were mostly put up at auction at a meeting of the club, and the sum realized carried forward to the next year's purchases. Subscriptions to magazines also were often included and these were circulated among the members. The term is more broadly and generally applied to clubs of two or more persons whose sole purpose it is to publish original matter or reprints of scarce or curious books, for distribution only to members, or among a limited circle of subscribers. Some famous English book clubs (*e.g.* the Roxburghe, Maitland, Abbotsford, and Bannatyne), were formed at the beginning of the 19th century.

'The Junto,' founded in Philadelphia by Franklin in 1726, may be called the earliest of American book clubs, though not originally organized as such, since with its encouragement and support Franklin began in 1741 the issue of *The General Magazine, and Historical Chronicle*, the first magazine published in this country, which had no subscribers, the expense of printing being borne by its projectors. 'The Hartford Wits,' and 'The Drone Club' of New York, appear to be the only others organized in the 18th century. The earliest to declare its purpose to be a book club for publishing, as defined above, was 'The Seventy-Six Society' organized in Philadelphia in 1854. Since then some forty or more have come into being, the best known of which are 'The Rowfant Club' of Cleveland, 'The Filson Club' of Louisville, 'The Philobiblon Club' of Philadelphia, and 'The Grolier Club' of New York. For a complete account, see A. Growoll's *American Book Clubs, their Beginnings and History* (1897); see also J. H. Burton's *The Book-Hunter* (1863).

Book Collecting. We read of book collecting in the very opening pages of history, as is told elsewhere (see LIBRARIES). The Sphinx had a library at her breast, and the sands of the Great Desert have surrendered some of the most fragile of palæographical treasures. The Greeks had traditions of their book-collecting kings. The Romans collected books among their spoils of war, and Lucullus was a very prince of collectors. Seneca rails at 'Our idle book-hunters, who,' he says, 'know about nothing but titles and bindings.' St. Jerome declared that he had never seen anything to compare with the library of St. Pamphilus, who collected at Cæsarea 30,000 vols., almost all consisting of the works of the Fathers. The patriarch Photius, a famous book-collector and critic, through writing up the contents of his library for an absent brother, in his *The Myriad of Books* abridged the narrative or doctrine of nearly three hundred authors, and thus preserved many of the most valuable classics.

Benedict Biscop was the first English book-collector, the precursor of many a name famous in the annals of book hunting and preserving. St. Boniface begged his friends to send him books as a refreshment in the wilderness. Alcuin was returning from book-buying at Rome when he met Charlemagne at Parma, and joined him in his great work of reviving learning, and literature. Lanfranc at Canterbury imported a large quantity of books from the Continent, and England in the 12th century has been called the paradise of scholars. Richard de Bury or d'Aungerville was a most ardent bibliophile with an ecstatical love for his books, for which he scattered his money with a light heart. He had more books than all the other bishops in England.

Petrarch collected books in many parts of Europe, and through his liberality in lending caused the loss of the only known copy of a treatise by Cicero which was awaiting transcription in his library. Magliabecchi, the jeweller's shop-boy, renowned for his knowledge of books, left 30,000 volumes at his death to the city of Florence, and his name to one of the noblest collections in the world. Matthias Corvinus, king of Hungary, collected the largest and finest library in Europe, afterward nearly all destroyed by the Turks. Birckheimer of Nuremberg had some MSS. that 'came to him out of the spoils of Hungary,' in which 'there is to be seen his head graved by Dürer, one of the first examples of sticking or pasting of heads, arms, or cyphers into volumes,' says Oldys. Sir Thomas More was one of England's most learned book-collectors.

The names of royal collectors would fill a volume, but Henri Deux, Catherine de' Medici and Diane de Poitiers constitute a most noteworthy trio. Marguerite de Valois, Anne of Austria, and Queen Marie Lesczinska are to be remembered, the first as queen of *femmes bibliophiles*, Anne for the exquisite bindings done for her by Le Gascon, and Marie for her books bound by Padeloup. Queen

Elizabeth was a collector, and Henry VII. founded the royal collection which later was given to the nation by George II. George III. made another collection which his successor for a large consideration, also gave to his people. Cotton, Harley, Bodley and Ashmole are names immortalized by their famous collections. The same may be said of Grolier and his successors on the Continent, among whom are Petau, De Thou, Pinelli, Peiresc and Libri. Among the more modern European collectors are William Beckford, the Earl of Ashburnham, Henry Huth, Henry Perkins, Henri Béraldi, Frederick Locker, and Thomas J. Wise.

The United States.—Fascinating and inexhaustible as is the story of book collecting in the Old World, covering, as it does, centuries of time, the success attained by American collectors in less than one hundred years is really remarkable. When the collections made abroad are scattered by sale at auction or otherwise, the choicest of their treasures are generally secured for American collectors who are ever on the alert and ever increasing in number. In consequence of this keen competition the prices of rare books often reach startling figures. Among noted collectors of the United States James Lenox was a pioneer; he secured for his country a copy of the Gutenberg Bible and many first folios of Shakespeare. Other important names in the field of collecting are John Carter Brown and John Nicholas Brown whose splendid collection is owned by Brown University; J. Pierpont Morgan; Henry E. Huntington, whose collection is housed in San Gabriel, Cal.; Robert Hoe; Edward Ayer; Henry C. Folger, famous for his Shakesperiana; and Harry Elkins Widener, with the most complete Stevensoniana in the world.

Fields of Collecting.—Each collector has his own hobby and collects generally on special and narrow lines. Books may be rare and yet sell for a low price. Others not so rare sought by many collectors at the same time fetch good prices. Shakespeare and Elizabethan and pre-Elizabethan authors are always a favorite field for collectors. Shelley, Burns, Dickens, Thackeray, Stevenson, Conrad and Kipling occupy high positions, and in the American field Poe, Bret Harte, Mark Twain and Walt Whitman are favorites. Other fields in popular favor are Americana, which includes all works relating to America; first editions of modern authors; books illustrated by such artists as Phiz, Cruikshank, Kate Greenaway, Hugh Thomson and Beardsley; books on the Civil War; books on the Great War, notably the Hoover collection at Stanford University; and books noted for typographical style and excellence.

Consult Eltons' *Great Book Collectors;* W. T. Fletcher's *English Book Collectors;* Arnold's *Ventures in Book Collecting* (1923); I. A. Williams' *The Elements of Book Collecting* (1927); J. T. Winterich's *A Primer of Book Collecting* (1927); for prices of books see the annual volumes of Slater's *Book Prices Current* (London); L. S. Livingston's annual volumes of *American Book Prices Current* (New York), and the latter's *Auction Prices of Books* (New York).

Book Illustration, See ILLUSTRATION OF BOOKS.

Bookkeeping, a method of recording business transactions by means of figures. If a business enterprise operated by an individual or group of individuals, is to succeed it must base its future plans and policies on facts. The facts most vital to a given business are: What is our present financial status or condition? How does this condition compare with our condition at some definite date in the past (usually one year ago)? What were the reasons for this change? What was our income and what were its sources? What were our costs of doing business? To answer these questions it will be necessary to have a record of all business transactions for the past period. Furthermore, these records must be summarized and condensed into statements which may easily be interpreted by the business executives. Therefore at the beginning of a business, preparation should be made for compiling this vital information by providing for a bookkeeping system. Another reason for a bookkeeping system is to provide the information required on the Federal and State income tax blanks. The person who makes the records is known as a bookkeeper.

While bookkeeping systems are based on the same fundamental principle which will be explained later, the great variety of types of business makes it necessary to vary the system to meet specific requirements. In other words bookkeeping systems should be 'custom-made,' not 'ready-made.' An expert should be engaged to study the particular business and plan a system of accounts. He should then explain the details to a bookkeeper who will assume the responsibility of recording the business transactions from day to day.

Bookkeeping records are based on the theory that all transactions are dual in character; they affect the business in two ways of equal degree.

At the time the business is started there is an equal exchange—the business receives cash or other assets and in exchange the business owes the proprietors for their investment. Since this investment is permanent and will not have to be repaid as long as the business exists, the obligation is called Capital. At this point the assets equal the capital; which, when expressed as an equation, is $(A = C)$. Subsequently the business will purchase other assets, either in exchange for other assets or on a promise to pay in the future. If purchased on a promise for future payment, the business will assume an obligation to pay, which is technically known as a liability. At this point the fundamental bookkeeping equation becomes: Assets equal Liabilities plus Capital $(A = L + C)$. Assets originate on the left of the equation and are referred to as debits. Liabilities and Capital originate on the right side and are referred to as credits. The assets, liabilities, and capital have many subdivisions as indicated in the following illustrations, and each of the subdivisions are recorded under their respective headings in a form called an account. An account may have various rulings but in every case it will be arranged with two sides—the left side which is called the debit and the right side the credit. In the following abbreviated forms any of the individual assets, liabilities, or capital could be substituted at the heading, and the rules for increases and decreases would apply.

From the foregoing it is evident that any business transaction will involve either an increase in an asset, a decrease in an asset; an increase in a liability, a decrease in a liability; an increase in capital, or decrease in capital. The bookkeeper must analyze the various business transactions and classify them according to the accounts to be debited and credited. The following illustrates how this analysis is done in a few representative transactions: John Doe invested $10,000.00 in a business enterprise. The entry—debit cash (asset cash is increased) and credit John Doe (capital increased). Bought store equipment for $1,500.00. The entry—debit Store Equipment (asset store equipment increased) and credit cash (asset cash decreased). Bought truck for delivery purposes $1,000.00 paying $500.00 cash and giving notes for bal-

ASSETS (Anything Owned)

Dr.	Cr.
Always originate as debits. The following are some of the common assets: Cash Accounts Receivable (oral promises) Merchandise Inventory Delivery Equipment Furniture and Fixtures Notes Receivable (written promises) Land Buildings	Decreases in any asset would be credited to the appropriate asset.

LIABILITIES (Anything Owed)

Dr.	Cr.
Decreases in any liability would be debited to that liability.	Always originate as credits. The following are some of the common liabilities: Accounts Payable (oral promises) Notes Payable (written promises) Mortgage Payable

CAPITAL (Ownership or Proprietorship)

Dr.	Cr.
Decreased by withdrawals of the owners. Also decreased by Costs such as: Purchases Freight and Express In Freight and Express Out Salaries Office Expense Delivery Expense Selling Expense Interest Expense Discount on Sales, Etc.	Always originate with an investment by the owners. Capital may be increased by an additional investment or by revenue or profit. Some sources of profit are: Sales Interest Income Discount on Purchases Income from Real Estate Income from Investments

ance. The entry—debit Delivery Equipment (asset increased) and credit cash (asset decreased) and credit Notes Payable (liability increased.) Bought merchandise $125.00 from S. Smith on account (oral promise). The entry — debit purchases (decrease in capital by a cost) and credit S. Smith (increase in liability). Sold merchandise $165.00 for cash. The entry—debit Cash (increase in asset) and credit Sales (increase in capital by income). Paid employees salaries $100.00. The entry—debit Salaries (decrease in capital by cost) and credit Cash (decrease in asset).

After the transactions have been analyzed into debits and credits they must be recorded in permanent records. The records have three natural divisions: (1) Books of original entry (those books in which the entry is made at the time of the transaction; (2) Ledger or book of accounts where the information taken from the books of original entry is classified; and (3) The summarizing and interpreting of the results (Trial Balance, Stock Taking, Balance Sheet, and Profit and Loss Statement.)

General Journalizing.—There is one fundamental book of original entry, the Journal, in which the bookkeeper records the business transactions according to debits and credits. While it is possible to record any transaction in this book, the detail consumes too much time and space. Therefore as soon as a given business has a number of transactions of a similar nature, a special journal is devised to reduce the detail to a minimum. The feature of a special journal is the fact that since all entries are of the same type the individual amounts may be totaled and posted in one amount thus saving much time in posting. Since several of these special journals are to be introduced it becomes necessary to call the original journal the General Journal for the purposes of identification.

Sales Journal. — Entries in this journal are usually made from the duplicate of the sales invoice, after which the duplicate is filed away. Some firms arrange the duplicate sales invoices in book form and post direct to the customer's account, thus eliminating the sales journal. The total sales is credited to Sales account thus balancing the individual debits to the customers.

Purchase Journal. — Entries are made from the invoices received for the merchandise purchased. The total is posted in one amount to the debit of the Purchase account at the end of the period.

Cash Receipts Journal.—This is used for all receipts of cash which include checks, currency, and money orders. Simple forms are ruled similar to the General Journal but special columns may be added. The illustration is an advanced form which provides for cash sales and also for a separate column for receipts from customers such as is necessary when a separate ledger or card file is used for customers' accounts. The individual entries are easy to understand, but the method of footing and labeling the results requires in addition a complete knowledge of bookkeeping theory.

CASH RECEIPTS

Date	Account Cr. Explanation	GL FO	General	AR FO	Accts. Receivable	Disc. on Sales	Net Recpts.
19— Jan. 1	Balance on hand 6440.						
1	Interest Income. Int. Allowed by bank on average daily balance for last month.		6.70				6.70
12	M. H. Twoomey On acct.				1200.00		1200.00
13	Frank Legro. In Full Invoice Dec. 24				1000.00	20.00	980.00
29	C. O. D. Customers E. Bates, Salem, Mass.				110.00		110.00
30	Notes Payable Disc. own 6 ds. note at bank.		1000.00			10.00	990.00
			1006.70		2310.00	30.00	3286.70
30	General Ledger	√	1006.70				
	Accounts Receivable, Cr.		2310.00				
	Discount on Sales, Dr.						20.00
	Interest Expense, Dr.						10.00
	Cash Dr.—Net Receipts						3286.70
			3316.70				3316.70
	Add—Balance—Jan. 1						6440.00
							9756.70

CASH DISBURSEMENTS

Date	Account Dr. Explanation	GL LF	General	AP LF	Accts. Payable	Disc. on Pur.	Net Payments
19 Jan. 1	Frt. on Purchases Inv. C. E. Mudgett		6.25				6.25
2	Notes Payable 30 ds. int. bearing note given P. T Kurt due today		500.00				500.00
2	Interest Expense On above		2.50				2.50
6	C. R. Gibbs Inv. Dec. 10 less discount				650.00	13.00	637.00
7	Salaries For week		150.00				150.00
10	C. E. Mudgett Inv. Dec. 12				700.00	21.00	679.00
			658.75		1350.00	34.00	1974.75
10	General Ledger		658.75				
	Accounts Payable, Dr.		1350.00				
	Discount on Purchases, Cr.	√					34.00
	Cash Cr.—Disbursements						1974.75
			2008.75				2008.75
	Balance Carried Forward						7747.95
							9756.70

Cash Disbursements Journal.—This is for all disbursements of cash. It may have a simple two-column ruling or additional columns may be added. In small firms these two cash journals are arranged in one book—the receipts on the left page and the disbursements on the right. When arranged as one book it is called a Cash Book. The illustration which follows is ruled as if it were used as the right side of the cash book.

Posting.—After the records have been made in the books of original entry the various debits and credits are transferred to their appropriate account in the ledger.

Accounts with customers are often kept on cards or in a separate ledger. It is very important that the balance owed by a customer be available at a glance. This is accomplished by special ruling.

Trial Balance.—After all posting has been completed the bookkeeper tests the accuracy of the posting by systematically listing all open accounts in the ledger. (An account is one which has one side larger than the other.) In listing the accounts a two-column form is used. Those with the debit side the larger have the amount extended into the first column, and when the credit side is the larger the amount is extended into the second column. If the posting has been done correctly the two columns will have the same totals which will indicate that the ledger is in balance, equal debits for equal credits. This form is called a *trial balance.* While it proves that there have been equal debits and credits posted, it does not prove that the original entries are correct. The trial balance also serves as a convenient summary of the ledger.

Balance Sheet.—At the end of the business year the records for the year are used as a basis for determining the present financial condition or capital of the business and the profit or loss for the year. The form which is used for the purpose is called the *balance sheet.* It is based on the fundamental equation Assets = Liabilities + Capital, or expressed in another way $A - L = C$. Much of this information may be taken from the trial balance. However some of the assets will be valued less than the amounts in the trial balance because of depreciation (lessening in value due to wear and tear). The value of merchandise on hand is not shown in the trial balance but has to be determined by actual count valued at cost price (physical inventory). Some firms keep a proper record of all merchandise which shows the amount on hand at all times (perpetual inventory). There are also certain unrecorded assets and liabilities such as interest accrued on notes receivable, and interest accrued on notes pay-

Trial Balance, December 31, 19—

Accounts	Dr.	Cr.
Cash	15964.35	
Merchandise Inventory (old)	8200.00	
Furniture & Fixtures	750.00	
Delivery Equipment	4000.00	
Notes Receivable	5797.65	
S. G. Mayo	1120.00	
C. O. D. Customers	900.00	
M. B. Franklin	2100.00	
Notes Payable		1000.00
M. E. Phelps		125.00
W. H. Bristol		300.00
Eugene Anderson		175.00
Purchases	27000.00	
Returned Purchases & Allowances		1700.00
Sales		41000.00
Return Sales & Allowances	1500.00	
F. W. Keller—Capital		20000.00
F. W. Keller—Personal	1000.00	
C. F. Hall—Capital		14000.00
C. F. Hall—Personal	800.00	
Advertising	900.00	
Freight on Purchases	250.00	
Freight & Expressage Out	400.00	
Interest Expense	145.00	
Interest Income		27.00
Discount on Purchases		470.00
Discount on Sales	410.00	
Insurance	360.00	
Salaries	6000.00	
General Expense	1200.00	
	78797.00	78797.00
Supplementary Data		
Merchandise Inventory (new)	7200.00	
Depreciation on Furniture & Fixtures	75.00	
Depreciation on Delivery Equipment	800.00	
Interest Accrued on Notes Receivable	23.00	
Interest Accrued on Notes Payable		12.00
Unexpired Insurance	120.00	

able, and unused costs such as unexpired insurance, etc. The following is a form of balance sheet.

Profit and Loss Statement.—After the balance sheet has been prepared, it must be supplemented by another statement which will show in itemized form the sources of income and the nature and amount of the costs.

Balance Sheet as at December 31, 19—

ASSETS					
Current:					
Cash		15964	35		
Notes Receivable		5797	65		
Interest Accrued on Notes Receivable		23	00		
Accounts Receivable:					
L. G. Mayo	1120.00				
C. O. D. Customers	900.00				
M. B. Franklin	2100.00	4120	00		
Merchandise Inventory (new)		7200	00	33105	00
Fixed:					
Furniture & Fixtures		675	00		
Delivery Equipment		3200	00	3875	00
Deferred Charges:					
Unexpired Insurance		120	00	120	00
Total Assets				37100	00
LIABILITIES					
Current:					
Notes Payable		1000	00		
Interest Accrued on Notes Payable		12	00		
Accounts Payable					
M. E. Phelps	125.00				
W. H. Bristol	300.00				
Eugene Anderson	175.00	600	00	1612	00
CAPITAL					
F. W. Keller:					
Capital Account	20000.00				
Less—Personal Account	1000.00				
Net Investment		19000	00		
Add—Interest on Investment		1200	00		
½ Balance of Profit		624	00	20824	00
C. F. Hall:					
Capital Account	14000.00				
Less—Personal Account	800.00				
Net Investment		13200	00		
Add—Interest on Investment		840	00		
½ Balance of Profit		624	00	14664	00
Total Liabilities and Capital				37100	00

Closing the Books.—At the end of the business, or fiscal year, the balance sheet will show the condition of the business. Because of the fact that many unrecorded items had to be included in determining present capital it is apparent that the ledger is not in agreement with present condition and must be made so. To accomplish this, the new accounts appearing in the balance sheet must be added to the ledger, and those accounts which do not agree in amounts must be adjusted to the balance sheet figures. Furthermore all the cost and income accounts have served their purpose and they are closed into the capital account of which they are sub-divisions. The necessary adjusting and closing is done by means of journal entries which when posted to the ledger will bring the ledger into agreement with the balance sheet. Proof that this has been accomplished is furnished by taking another trial balance which is technically known as a *Post-Closing Trial Balance.*

Single-Entry Bookkeeping. — Single entry is not worthy of being called a system. At best it is nothing but incomplete double entry. It is memorandum bookkeeping—keeping book records of only what is of especial interest. Theoretically it is a system which records only the personal accounts (accounts with persons who owe the business and those whom the business owes) which limits its practicability to very small enterprises where the proprietor gives his personal attention to all details. If a firm is large enough to employ a bookkeeper, the books should be kept on the double-entry basis. However, if books have been kept on an incomplete double entry plan or single entry, it is possible to compute the approximate profit or loss, but it cannot be itemized. (1) Determine the present capital by preparing a balance sheet (A – L = C); (2) Compare the present capital with that of a previous period; (3) If an increase in capital, add any drawings and deduct any additional investments. The result will be the approximate profit.

History of Bookkeeping.—In Babylonia as early as 2285 B.C. drafts and checks were used and legal decisions were recorded covering receipts, inventories, sales and accounts. Records were made on tiny sun-baked slabs of clay written on front, back and sometimes on the edges. The early Egyptians kept their accounts on papyrus, while the Greeks required all the public officials to render an account of the funds entrusted to them. These records were engraved on stone and placed in public view. Then as now, publicity was a mighty agency for honesty. In early Rome we have the first evidence of the use of a book of original entry. Family heads, bankers and government officials recorded transactions on a memorandum form and later transferred them to a register.

One of the earliest references to account keeping in England is mentioned in connection with the story of the Domesday Book. Assessments of taxes were recorded on tally sticks which were notched sticks showing amount of taxes owed by each land owner. The same number and kind of notches were made on each end of the stick, after which it was cut into two parts; one to be retained by the treasurer and the other taken to the tax payer by a sheriff.

None of the earlier records were on the double-entry plan. However, in 1494 Luca Paciolo, an Italian monk, published a book entitled *Everything about Arithmetic, Geometry, and Proportion,* a chapter 'Reckonings and Writings' is devoted to double-entry bookkeeping. Paciolo says the object of bookkeeping is to give information about assets and liabilities. His system required three books—a memorial (memorandum book), a journal, and a ledger.

Modern Methods and Mechanical Aids.—Present day bookkeeping systems are refinements of Paciolo's theory. Bookkeeping procedure is about the same for the three forms of business organization — Sole Proprietor, Partnership, and Corporation. The essential difference between the records for proprietorship and partnership is that the bookkeeper should keep a separate capital account for each partner, whereas in the corporation there are no accounts with partners, but instead two new accounts are used—Capital Stock, and Surplus.

If a business employs only one bookkeeper, he is a bookkeeper in the old meaning of the word; he does every part of the work. A system which is becoming increasingly popular is one known as the 'Cash-Journal' system. In fact it is the same fundamental system which was outlined in this article, except that *all* the books of original entry are combined in one form or one book of many columns. Leading stationery stores can supply this form. If the business is large enough to require many bookkeepers the bookkeepers become special clerks in certain phases of the work. One will be cashier, another will make out bills, while several will spend their entire time in posting.

When a business has over fifty customers its bookkeeping system should provide for a subsidiary ledger or card file for its customers. The main advantage of such a plan is that the bookkeeping can keep pace with the growth of the business. When the number of customers' accounts becomes too large for one bookkeeper, the accounts may be divided into two ledgers and another ledger clerk hired. This dividing of accounts may go on indefinitely. The summary of all the customers' accounts is recorded in the general ledger under an account 'Accounts Receivable,' which is referred to as a controlling account. A similar plan is usually employed for handling creditors' accounts. To operate a system employing controlling accounts, it is necessary to add special columns to the books of original entry, with a corresponding change in the method of summarizing the footing of the various columns for purposes of posting. The illustration of the cash journals demonstrate the use of special columns for the subsidiary ledgers.

Modern bookkeeping systems make extensive use of mechanical devices. Sales invoices are made out on various kinds of billing machines which are combinations of the typewriter and the calculating machine. Postings to customers' accounts are made with posting machines, which combine the same features of the billing machine but adjusted to posting work. The development of the cash register has been of especial significance to the bookkeeper. The latest development is a combination of the cash register and posting machine which records the receipt on a permanent record, and at the same time prepares a receipt and posts the payment to the customers' account and extends the balance due. This machine is used extensively in the savings departments of banks and by furniture dealers and installment houses. However, while the use of modern mechanical devices have made it possible to do more work with greater ease, they have in no sense decreased the demand for a knowledge of methods and procedures.

Consult Koopman and Kester's *Fundamentals of Accounting* (1923); Finney's *Accounting Principles and Bookeeping Methods* (1924); Elwell and Toner's *Bookkeeping and Accounting* (1926); Jackson, Sanders and Sproul's *Bookkeeping and Business Knowledge* (1926); Bowman and Percy's *Principles of Bookkeeping and Business* (1927); Baker and Prickett's *20th Century Bookkeeping and Accounting* (1928).

Bookland. See BOCLAND.

Book Lice, a name applied to the insects of the family Atropidæ, also called lesser death-watches. They are tiny colorless insects often found inhabiting old books, to which the larvæ are often very destructive. They are also found in natural history collections and in strawbeds. See DEATH-WATCH.

Bookmaker. See BETTING.

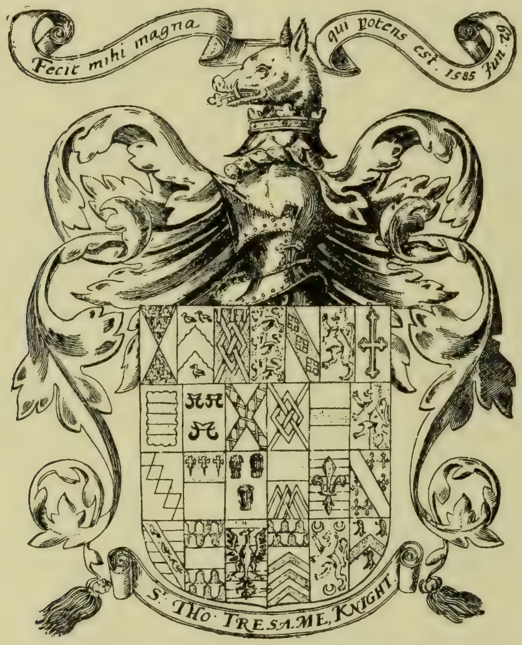
Book of Common Prayer. See PRAYER BOOK.

Bookplates, pictorial labels used to denote the ownership of books. Their use is said to be nearly as old as the printed book itself, but the earliest bookplate of which we have definite knowledge dates from about 1480. In the 15th century it became common, especially in Italy, to introduce the arms of the owner of a fine book into the illuminated border round the first page of text; and in a few woodcut borders to books printed by Erhard Ratdolt and other printers in Italy blank shields are conspicuous, in which the owner's arms might be inserted. The printing of separate labels to be pasted into a number of volumes began in Germany towards the close of the same century, the example usually quoted as the earliest being that found in the books presented by Hildebrand Brandenburg of Biberach to the Carthusian monastery at Buxheim, in Swabia, about 1480, though the woodcut itself is probably ten or twelve years later. Early in the 16th century the designing of bookplates engaged the attention of many German artists, notably Albrecht Dürer, Lucas Cranach, Jost Amman, and Hans Holbein. In France, Jean Bertaud de La Tour-Blanche used a bookplate as early as 1529; but only one other of French ownership in the 16th century has yet been traced. In England, a woodcut with the donor's arms and a printed inscription was placed in books presented by Sir Nicholas Bacon to the University of Cambridge in 1574; the first English bookplate denoting personal ownership was that of Sir Thomas Tresham, which is dated June 29, 1585. Until the second half of the 17th century the use of bookplates was rare both in France and England, most owners preferring to stamp their arms or names on the leather covers of their books.

Towards the end of the century bookplates increased rapidly in England, and for about a dozen years from 1698 there is a curiously large number of English bookplates bearing the dates of the years in which they were engraved. The styles of English bookplates have been distinguished as 'early armorial,' with no ornament save heavy mantling; the 'Jacobean,' in which the shield mostly rests on a bracket and is surrounded by a frame resembling wood-carving; 'Chippendale.' in which the frame takes the form of a border of open flower- and shell-work of delicate grace and lightness; and 'wreath and ribbon,' whose decoration resembles that of Sheraton furniture.

When bookplates became fashionable, about 1880, armorial designs were largely supplemented by pictorial and emblematic ones. Until about the date just mentioned the collecting of bookplates was hardly known, but it sprang suddenly into favor; some treasure them because of the famous persons for whom they were made; others as the work of distinguished engravers, and for the beauty of their designs; and still others for the aid given by their heraldic designs in tracing family history. The first known collector was a Miss Jenkins, of Bath, England, who began collecting in 1820. The first great collection in England was formed by Sir Wollaston Franks, numbered over 100,000 specimens, and was bequeathed by him to the Print Room of the British Museum.

The earliest bookplates used in America were brought over by some of the colonists or were made to their orders by English engravers. The first American bookplate bearing a date was the work of Nathaniel Hurd, of Boston, executed for Thomas Dering in 1749. Thirty plates signed by him are known, and others are attributed to him. Paul Revere was one of the small coterie of bookplate engravers, but speciments of his work are rare and costly. The early American plates are chiefly armorial in design; many printed labels, some ornamental in composition, were used. The publication of Mr. Warren's book in 1880 aroused a wide interest which culminated in the foundation of the Ex Libris Society, of London, in 1890. Bookplates usually bear inscriptions beginning with the words Ex libris. . . . (*i.e.* One of the books of . . .), and these two words have been adopted as a convenient international name for the plates themselves. The extensive literature on the subject comprises books, monographs, and articles contributed to periodicals. Several important collections exist in the United States, and several expert engravers here and abroad have earned international reputations for their designs and work. Societies have been formed in Germany (1896), France (1894), the United States (1896), and Austria (1903), and periodicals devoted to the subject are issued in London, Paris, and Berlin. Consult H. W. Fincham and J. W. Brown's *A Bibliography of Bookplates;* J. Leicester Warren's *A Guide to the Study of Bookplates;* H. W. Fincham's *Artists and Engravers of British and American Bookplates;* G. W. Fuller's *A Bibliography of Bookplate Literature* (1926).


Fecit mihi magna qui potens est. 1585 Jun 29
Sr Tho. Tresame, Knight

Bookplate of Sir Thomas Tresham
(The first private bookplate in England)

Books Burnt by Order. Probably the most drastic holocaust of books burned by order that history records occured in the year 221 B.C., when the Emperor Chi Wang-ti, of the Chinese dynasty of Tsin, desiring to destroy the power of tradition, caused to be burned all the books in his empire, except works on divination, agriculture, and medicine. And occasionally in the ancient classic writers mention is made of the burning of obnoxious or inconvenient books; among others, the works of Pythagoras are said to have been burned at Athens. Antiochus Epiphanes ordered all copies of the Jewish Law to be burned. Thus the burning of heretical books is not of Christian origin. The destruction of Christian books formed part of the heathen persecution of Diocletian, who in A.D. 303 ordered all such writings to be burned.

The introduction of the practice among Christians is ascribed to Osius, bishop of Cordova, who persuaded Constantine to order the writings of Arius to be committed to the flames, while similar treatment was afterward meted out to the writings of Nestorius and Honorius. In 1121 Abélard was condemned to burn his own *Introductio ad Theologiam* because of its false teaching with regard to the Trinity. Bookburning was inaugurated in England by the destruction of copies of the Antwerp edition of Tyndale's New Testament at St. Paul's in 1527, followed by the burning of a second edition in 1530. Among other books ordered to be burned were Suarez's *Defensio Catholicæ Fidei contra Angilicanæ Sectæ Errores,* burned by order of James I.; Barker's Bible and Prayer Book (1631), in which the word 'not' was omitted in the seventh commandment; Luther's works, at St. Paul's (1530); Tyndale's *The Wicked Mammon* and *The Obedience of a Christian Man* (1546); Simon Fish's *The Supplication of Beggars* (1546); the anonymous *Revelation of Antichrist* (1546); Simon Fish's translation from the German of *The Summary of Scripture* (1546); and all the works of Frith, Tyndale, Wycliffe, Joy, Rowe, Basil, Bale, Barnes, Coverdale, Turner, and Tracy.

Book Scorpion, a general name given to members of the arachnid order of Pseudoscorpionidæ, which includes minute insects found in old books, under bark, and in vegetable débris in temperate and tropical countries. They generally resemble scorpions, but lack the long tail and sting.

Book Trade. See PUBLISHING.

Bookworms, the popular name given to several insects or their larvæ, which feed on the paste used in binding books, and bore holes both through the binding and through the pages of the book itself in order to get it. The commonest and most mischievous of bookworms are the beetles *Sitodrepa panicea,* found both in the larval form and as full-grown insects, and the larva of *Attagenus pellio.* Other troublesome species are the small beetles *Ptinus fur, Dermestes lardarius,* and the larva of *Anthrenus varius.* The insect known as the silverfish (*Lepisma*) is also a pest in damp libraries. Brushing and cleaning, fresh air and use, are the best preservatives against ookworms; but subjection to considerable heat and sprinkling with pure pyrethrum powder are approved remedies.

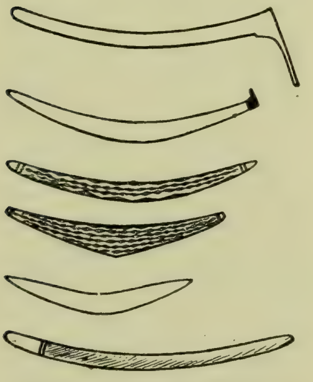
Boole, GEORGE (1815–64), English mathematician and logician, was born in Lincoln, the son of a small tradesman. When a very young man he became assistant in a private school in Doncaster, later established his own school, and in 1849 was appointed professor of mathematics in Queen's College, Cork. He published two important textbooks on *Differential Equations* (1859), and on *Finite Differences* (1860), and contributed many valuable articles to scientific journals—*e.g.* 'Theory of Analytical Transformations,' in *Cambridge Mathematical Jour.*

(1839), and 'General Method in Analysis,' in *Philosopical Transactions* (1844). His most remarkable work, however, was the *Laws of Thought* (1854), in which symbolic language and notation were employed to express purely logical processes.

Boom, a spar used to stretch the foot of a fore-and-aft sail. It pivots on the mast and its after-end is controlled by the sheet. (See Ship; Yacht.) Also any spar projecting abeam to which the boats of a ship at moorings may be made fast, or the supports for the torpedo nets. Also the barrier of timbers, chains, or other material extended across the mouth of a harbor to prevent the entrance of hostile vessels.

Boom, bōm, town, Belgium, in the province of Antwerp, 11 miles south of Antwerp. It has brickworks, salt-pans, tanneries, and breweries. Pop. 19,200.

Boomerang, a missile weapon of the Australian aborigines, which is a curved piece of hard wood, somewhat resembling a scimitar, about three feet long and three inches wide, flat on one side and slightly rounded on the other, with a sharp edge, but exhibiting variations in shape and dimensions according to locality. It is thrown with the convex or cutting edge pointing towards the object aimed at. Its great characteristic is that, if it encounters no heavy obstacle in its flight, it begins, owing to its peculiar shape, a retrograde motion when its first force is spent, and thus returns to the place from which it has been thrown. A very slight impediment does not check its outward course, for it has been known to slice off the head of a flying bird and yet return to the thrower. It is a keen and deadly weapon, and usually inflicts a fatal wound, whether the object it strikes is a bird in the air, or a man or other animal on the ground. Its impact with any serious obstacle, of course, absorbs its motion, and it falls to the ground.



Various Kinds of Boomerangs

Boondee. See Bundi.

Boone, city, Iowa, county seat of Boone County, on the Chicago, Milwaukee, St. Paul and Pacific, the Des Moines and Southern, and the Chicago and North Western Railroads; 47 miles northwest of Des Moines. Features of interest include a State park, a public library, a hospital and a Masonic home. It is a centre for the export of coal and lumber and there are deposits of potter's clay in the vicinity. Large railroad and machine shops are situated here and there are silk mills and foundries. Pop. (1910) 10,347; (1925) 12,812.

Boone, Daniel (1734–1820), famous American pioneer, was born near the site of the present Reading, Pa. With his father he removed about 1752 to the North Carolina frontier, where he became a hunter and trapper, and in 1767 and again in 1769–71 roamed the forests of Kentucky, then an almost unknown region. In 1775 he had an important part in the founding of Boonesboro, Ky. (named in his honor); and for many months in 1778 he was a captive in the hands of the Indians, who adopted him into their tribe. At length he made his escape and immediately after returned to Boonesboro where he assisted in repelling a fierce attack by the Indians which lasted about ten days. He subsequently held several offices among the frontier settlers. About 1799 he received a grant from Spain in what is now Missouri; and until the acquisition of this territory by the United States, through the Louisiana Purchase in 1803, was a Spanish official. Innumerable stories are told to illustrate his prowess and bravery as an Indian fighter and his great skill as a backwoodsman.

Boonton, town, New Jersey, in Morris County, on the Rockaway River, and the Delaware, Lackawanna and Western Railroad; 13 miles southwest of Paterson. It is a pleasant residential city and a favorite summer resort. There are iron works, and manufactures of rubber, baking ovens, and silk hosiery. Pop. (1920) 5,372; (1930) 6,766.

Boonville, town, Indiana, county seat of Warrick County, on the Southern Railway; 18 miles northeast of Evansville. The surrounding district is rich in timber and contains deposits of coal and potter's clay. There are manufactures of flour, fertilizers, underwear and tobacco. Pop (1920) 4,451; (1930) 4,204.

Boonville, city, Missouri, the county seat of Cooper County, on the right bank of the Missouri River, and on the Missouri Pacific, and the Missouri, Kansas and Texas Railroads; 169 miles west of St. Louis. It has a fine site overlooking the river from a bluff 100 feet high, and is a residential city. Harley Park includes 35 acres with athletic field and playgrounds. The State Reform School for Boys and Kemper Military School are situated here. Manufactures include boots and shoes, cob pipes, bags, bricks and flour. It was the scene of a Federal victory in June, 1861, when General Lyon routed a numerically stronger body of Confederates, under Col. J. S. Marmaduke. Pop. (1920) 4,665; (1930 est.) 7,000.

Boorde, bōrd or Borde, Andrew(?1490–1549), English traveller and physician, was born in Sussex. He joined the Carthusians, and about 1521 was made suffragan bishop of Chichester but about 1528 he obtained dispensation from his vow and went to France to study medicine. He made at least four tours on the Continent, one being to report on the state of feeling about Henry VIII. His principal works are *Dyetary* (1542), the *Brevyary of Health* (1547), and the *Fyrst Boke of the Introduction of Knowledge* (1547). His *Boke of Berdas* (beards) and his *Itinerary of Europe* are lost.

Booster, a form of dynamo for raising the voltage of an outgoing current to compensate for the drop in a long feeder. See Electricity, Distribution of.

Boot, Torture of the. The boot, used to extort confessions in Scottish judicial proceedings, was an iron or wooden frame in which the leg was enclosed. Wedges were driven between boot and leg with a mallet until the prisoner confessed, or was physically incapable of bearing further torture. It seems to have been in frequent use towards the end of the 16th century, but was discontinued in 1690, though not forbidden by law until 1709.

Bootan. See Bhutan.

Boot and Shoe Industry. See Shoes.

Boötes, bō-ō'tēz, an ancient constellation, supposed to represent the driver of the Wain, and sometimes called Arctophylax, the 'bear-keeper.' 'Late-setting Boötes' is among the star-groups mentioned in the *Odyssey* (v. 272), and Claudian (*De Raptu Proserpinæ*, ii. 190) speaks of 'piger Boötes,' in allusion to the upright position upon the horizon by which its setting is protracted. ε Boötes is an exquisitely tinted double star. Boötes revolves in about a hundred and thirty, 44 Boötes in two hundred and sixty years.

Booth, Agnes (1843–1910), American actress, was born (Marion Agnes Rookes) in Sydney, New South Wales. She had already made her first appearance on the stage when she went (1858) to San Francisco, where she acted for several years, and where she was married (1861) to Harry Perry, who died a year later. Her first great success was with Edwin Forrest at Niblo's Theatre, New York, 1865. She was married to Junius Brutus Booth 2d, in 1867, and after his death (in 1883) she bore his name, although married two years later to John B. Schoeffel, a Boston manager. Mrs. Booth made notable successes at Booth's, the Park, and the Madison Square Theatre, New York City, at the last of which she was the original Mrs. Ralston in *Jim the Penman.*

Booth, Ballington (1859–), Anglo-American evangelist, son of William Booth, founder of the Salvation Army, was born in Brighouse, England, and was sent by his father as commander of the Salvation Army to Australia (1885–7), and to the United States (1887–96). In 1896 he founded, on his own account, the Volunteers of America, a religious and charitable organization, of which he was commander-in-chief from the beginning. He wrote *From Ocean to Ocean* (1890). See Salvation Army; Volunteers of America.

Booth, Barton (1681–1733), English actor, was born in Lancashire. He was destined for the Church but was determined to become an actor and first appeared on the stage in London as Maximus in Fletcher's *Valentinian* (1700). Among his best representations were the Ghost in *Hamlet*, Othello, Henry VIII., and Brutus; but it was as Cato, in Addison's play of that name, that he gained his greatest fame (1713). He wrote a drama, *The Death of Dido* (1716) and several poems.

Booth, Charles (1840-1916), English sociologist, was born in Liverpool. He devoted his life to the preparation of works of unique value on social questions, notably *Life and Labor of the People in London* (10 vols. 1889–1903), a very able work full of carefully collected facts; *Pauperism, and the Endowment of Old Age* (1892); *The Aged Poor* (1894); *Old Age Pensioners* (1899); *The Religious Influences of London* (1903).

Booth, Edwin Thomas (1833–93), American actor, fourth son of Junius Brutus Booth (q.v.), was born in Belair, near Baltimore, Md., and received a desultory education, much of his youth being passed with his father on the latter's professional tours. In this way Edwin early became acquainted with the actor's art. His first appearance was accidental, as substitute in the part of Tressel, in *Richard III.*, at the Boston Museum (1849). His father at first opposed Edwin's following the stage as a profession, but gradually became reconciled to the idea, and the lad played minor parts in his father's company in many Southern and Eastern cities during the two years that followed. By accident or design, Junius Brutus Booth being unable to appear as Richard III. at a benefit in New York, Edwin was called upon to take the part when only seventeen, which he did creditably, at the same time making his first appearance in New York. In 1852 Edwin accompanied his father to San Francisco, where his brother, Junius Brutus, 2d, had preceded them. The father and sons acted successfully at San Francisco, but the venture failing in other places, the elder Booth returned, dying on his way home.

Edwin Booth

Edwin acted under his brother's and other managements for about a year in San Francisco, for the first time taking several important characters, such as Sir Giles Overreach, Hamlet, and Macbeth. He then went on a tour to the South Sea Islands and Australia with a company including D. C. Anderson and Laura Keene. Returning within a year to San Francisco, he acted in that city and neighborhood with varying success, returning to the East in 1856, and opening at Boston in April, 1857, as Sir Giles Overreach. The next month he appeared in New York, in *Richard III.* followed by a long list of principal parts, and for the first time establishing himself as a leading actor in that city. He married Mary Devlin, a charming young actress, in July, 1860, and shortly afterward they sailed for England, where Booth made his first appearances in London and other cities. Returning to New York, he was associated with the Winter Garden Theatre from 1862 until 1867, excepting the periods of retirement caused by the death of his wife and the assassination of Lincoln by his brother, John Wilkes Booth. During this connection he established himself as the leading actor of America, and, among other presentations of the standard drama, achieved a hundred-night run of *Hamlet*—an unprecedented feat at that time (1864). Booth then built his own theatre in New York, bearing his name, and opened it with *Romeo and Juliet* (February, 1869), Miss Mary McVicker, whom he shortly afterward married, playing Juliet to his Romeo.

Booth's theatre was the scene of many dramatic triumphs during his ownership (1869–74) and after. In 1874 he failed in business, but was able, by tours in the Southern States and California (1876), to recoup himself and pay his debts. In 1880 and 1882–3 Booth visited England and Germany, performing with Henry Irving in London, and receiving great honors from the German actors. He played a short engagement with Salvini at New York (1886), and in 1887 formed the combination with Lawrence Barrett that lasted until the latter's death (1891). He founded the club known as 'The Players' in New York, 1888, for the special benefit of actors, and in it are preserved his trophies and many memorabilia of his career. He lived there during the last four years of his life, and there he died in 1893. Consult Winter's *The Life and Art of Edwin Booth*, and Mrs. Grossman's (his daughter's) *Recollections, etc.;* M. J. Moses' *Famous Actor Families in America.*

Booth, James Curtis (1810–88), American chemist, was born in Philadelphia, Pa. He was graduated (1829) from the University of Pennsylvania and from 1832 to 1835 studied chemistry in Germany, Austria and England, in 1836 establishing at Philadelphia the first laboratory in the United States for instruction in analytical chemistry. He was professor of applied chemistry at Franklin Institute, 1836–45, and in 1849 was appointed melter and refiner of the U. S. mint, holding the latter position for the remainder of his life, and being the first to introduce nickel as an alloy in the U.S. coinage. He was editor-in-chief *of The Encyclopædia of Chemistry* (1850), and author of many scientific reports and papers.

Booth, JOHN WILKES (1839–65), American actor, son of Junius Brutus Booth (q. v.) and brother of Edwin Thomas Booth (q. v.). He left the stage in 1863, and devoted himself to secessionist plots, the last of which resulted in his shooting President Lincoln (q. v.) at Ford's Theatre, Washington, on the night of April 14, 1865. He escaped into Virginia, but was surrounded at Bowling Green, where he had taken refuge in a barn, and was shot by Sergeant Boston Corbett.

Booth, JUNIUS BRUTUS (1796–1852), American actor, was born in London, England. He adopted the stage as a profession in 1813, appearing for the first time as Campillo in *The Honeymoon* at Deptford. His first London appearance was made at Covent Garden in 1815, in a minor part. Two years later he won success in leading parts, especially Richard III., in the same city. In 1821 he sailed for America, which was thereafter his home. He opened at Richmond, Va., in *Richard III.*, and soon after performed in New York, rapidly winning appreciation from American audiences.

In 1825 Booth visited and acted in London, and in 1828 played a successful season at New Orleans, where he gave performances in French. The remainder of his career was uniformly successful. The death of two of his young sons temporarily unbalanced his reason, however, and he was afterward subject to fits of aberration. In 1852 he visited San Francisco, and there played with his sons, Edwin and Junius Brutus, Jr., to crowded houses. On his return to the East he was taken ill, and died on a steamboat while journeying from New Orleans to Cincinnati. He was thought not to have been excelled in the parts of Richard III. and Sir Giles Overreach; while his renderings of Shylock, Lear, and Iago were beyond any acting in his time. Consult Clarke's *Elder and Younger Booth.*

Booth, died MAUD BALLINGTON (1865–Sept 3 1948), Anglo-American reformer, was born (Charlesworth) in Limpsfield, England, of wealthy parentage. At the age of 17 she joined Miss Catherine Booth in Salvation Army work in Paris and Switzerland. In 1886 she married Ballington Booth (q. v.) and accompanied him to the United States, where they engaged in reform and relief work in the Salvation Army (1887–96), and after that time in the Volunteers of America (q. v.). Mrs. Booth is best known through her prison work, which she has carried on in all the State prisons of the United States. During the World War she served with the American Expeditionary Force in France.

Booth, WILLIAM (1829–1912), English religious leader and founder of the Salvation Army (q. v.), was born in Nottingham, and received a fair education. Having been attracted by the teachings of the followers of John Wesley, he joined the Methodist Church, and at the age of seventeen began to preach as a layman. At twenty-three he was appointed to the charge of a Methodist Circuit in Lincolnshire. After several years he resigned from the ministry and with his wife settled in London, erected a tent in the Whitechapel district, and there began a series of meetings which eventually resulted in the organization of the body known as the Salvation Army (q. v.).

General Booth's last public appearance was at the Royal Albert Hall, on the occasion of the celebration of his 83d birthday. He became totally blind during the last year of his life, and after a long illness died on Aug. 20, 1912. His death was the occasion of a world-wide tribute of respect, the funeral procession through London being one of the most remarkable ever witnessed there. His published works include, *In Darkest England and the Way Out*, in which he proposed measures to remedy existing conditions of poverty and vice, many of which have been successfully carried out; *Love, Marriage and the Home; The Training of Children; Religion for Every Day; Visions.*

Consult Railton's *The Authoritative Life of General William Booth* (1912); Begbie's *Life of General William Booth* (1920).

Booth, (WILLIAM) BRAMWELL (1856–), general of the Salvation Army (q. v.), was born in Halifax, England, was educated privately, and in 1874 commenced his public work. He is chairman of the Army's Life Assurance Society and its Reliance Bank, and was chief of staff from 1880 to 1912. By his father's nomination he succeeded him as general of the Salvation Army in 1912.

Died June 16, 1929.

Boothia Felix, bo͞o'thi-a fē'liks (named after Sir Felix Booth), a peninsula (area, 13,100 sq. m.) whose promontory, Murchison Point, is the most northerly part of the mainland of North America. The Gulf of Boothia lies to the east, separating Boothia from Cockburn Island and Melville Peninsula. Sir J. C. Ross, in 1831, fixed the position of the north magnetic pole here, lat. 70°5'17" N. and long. 96°46'45" W.

Booth-Tucker, EMMA MOSS (1860–1903), daughter of William Booth (q. v.), was born in Gateshead, England. She managed the international homes of the Salvation Army from 1880 until her marriage in 1888 to Frederick Tucker. With her husband she went to India, afterward to London, and thence to the United States in 1896. She held the rank of consul in the Salvation Army, and had joint and equal authority with her husband in its direction in the United States. She died from injuries received in a railroad accident.

Booth-Tucker, FREDERICK ST. GEORGE DE LAUTOUR (1853–), Anglo-American evangelist, was born in Monghyr, Bengal, India, and was educated at Cheltenham College. He held several positions in the Indian civil service but resigned in 1881 to join the Salvation Army (q. v.). He established its organization in India (1882), and conducted it there until 1891, when he went to London to take up the work of International Secretary. In 1888 he married Emma Booth, daughter of the founder, adding the name Booth to his own. On the resignation of Ballington Booth, in 1896, he was made commander of The Salvation Army in the United States. In 1904 he returned to England as foreign secretary, and in 1907 was appointed to take charge of The Army's work in India and Ceylon. He was awarded the Kaisar-i-Hind Gold Medal for public services by the Government of India. He returned to England in 1919. His writings include *The Life of Catherine Booth* (1890); *The Life of Consul Emma Booth-Tucker* (1903); *Muktifauj, or Forty Years with the Salvation Army in India and Ceylon* (1923); *Criminocurology, or The Cure of Crime; Jesus at His Home in Nazareth: Oriental Melodies* (1923); *Daily Mottoes* (in verse) *for Soul-Winners and Christ-Seekers* (1924).

Died July 17, 1929.

Boo'tle, county borough, Lancashire, England, continuous with Liverpool (q. v.), of which it is a suburb on the northwest. It has extensive jute factories, engineering works, foundries, lumber yards, and grist mills. The docks comprise some of the finest on the Mersey. Pop. (1921) 76,508.

Booty, in a military sense, the plunder taken from a vanquished people by the victorious enemy. Military regulations of civilized nations generally claim all booty to be the property of the sovereign—to be sold, or returned to the conquered, or given to the captors. For naval booty, see PRIZE MONEY.

Bopp, FRANZ (1791–1867), German philologist, was born in Mainz. In 1821 he became professor of Oriental literature and philology at Berlin, and in 1822 a member of the Royal Prussian Academy. In his great work, *Ueber das Conjugationssystem der Sanskritsprache* (1816), he endeavored to trace a common origin for the grammar of Sanskrit and the Aryan family of languages, and thus introduced a new era in linguistic study. He published also an edition, with a Latin translation, of *Nala and Damayanti* (1819), an episode in the *Mahabhârata; Ausführliches Lehrgebäude der Sanskritsprache* (1828); *Vergleichende Grammatik des Sanskrit, Zend, Greichischen,* etc. (6 parts, 1833–52), a comparative grammar which was translated into both English and French; *Ueber die keltischen Sprachen* (1839). His library was purchased by Cornell University. Consult Lefmann's *Life*.

Bo'ra, the sharp, cold, dry northeast wind blowing in fierce gusts (up to 130 miles an hour) along the coast of Dalmatia, from Albania in the south as far north as Trieste. It is due to the great and sudden increase in the barometric pressure in winter over the high plateaus of Central Europe, and to the rapid descent of heavy cold air into the valleys and over the Adriatic Sea.

Bora, BOHRA, or BOHREN, KATHARINA VON (1499–1552), wife of Martin Luther (q. v.). The daughter of a German gentleman, she entered a convent at Nimbschen, near Grimma, Saxony, while a young girl. After a perusal of Luther's works, she decided, with eight of her companions, to embrace the principles of the Reformation. With the assistance of the reformer, the nuns made their escape from the convent (1523), and Katharina was placed under the care of the burgomaster of Wittenberg until her marriage with Luther two years later. She survived her husband seven years, and died at Torgau, whither she fled from her home at Wittenberg to escape the plague.

Bora-Bora, or BOLA-BOLA, one of the Society Islands (q. v.), 30 miles in circumference; discovered by Cook in 1769. It consists of a volcanic peak surrounded by coral reefs.

Boracic (Boric) Acid (H_3BO_3), a weak acid obtained chiefly by the action of sulphuric acid on a concentrated solution of borax (q. v.), or by the recrystallization of native boracic acid. The latter occurs in the Tuscan lagoons of Italy, in the neighborhood of Monte Rotondo, Lago Zolforeo, Lardello, and Sasso. Around the fissures (*suffoni*) in the rocks of this mountainous region, from which steam impregnated with boracic acid escapes, basins of masonry are built and filled with water; these serve to condense the steam and dissolve the boracic acid. The basins discharge into a central reservoir, where time is allowed for the subsidence of mechanical impurities, after which the solution is concentrated, whereby the boracic acid crystallizes out.

Boracic acid forms transparent, colorless scales which yield a soft white powder of faintly bitter taste, soluble in 18 parts of cold water, 3 parts of boiling water, and 4 parts of glycerin. When neutralized by alkalis, borates are formed. When alcohol (especially wood spirits) is poured over boracic acid and ignited, it burns with a characteristic green-tinged flame. Its aqueous solution turns turmeric paper brown (like alkalis), even when hydrochloric acid is present. When heated to 100° C., metaboric acid (HBO_2) is formed; at 160° C., tetra- or pyro-boric acid ($H_2B_4O_7$); and at red heat, boric oxid (B_2O_3).

Boracic acid is poisonous to lower forms of life; but its antiseptic action is too feeble to be depended on against pathogenic germs. Aqueous solutions are soothing and detergent, free from irritating action, and are used as a local application in inflammatory conditions of the mucous membrane—*e. g.*, conjunctivitis, ulceration of the mouth. In the dry form, powdered boracic acid is frequently used as an antiseptic in dusting-powder (talcum) mixtures. It is also extensively employed in making glazes for earthenware and enamelware.

The use of boracic acid as a food preservative is prohibited in the United States by Federal enactment. Medical authorities differ as to its use in this respect, since it is claimed that fairly large quantities (*e. g.*, 7½ grains taken daily) produce no harmful effects. Its long-continued use, however, exerts a harmful influence on the human system. See BORAX.

Borage, bur'aj, a genus of plants belonging to the order Boraginaceæ. It is a somewhat coarse annual, hairy in character, with large leaves and beautiful blue flowers. The young leaves are sometimes used as a salad and as a flavoring in the making of beverages. The common borage (*Borago officinalis*) was formerly used in the preparation of cordials for its supposed exhilarating effect and is a favorite bee plant on account of its abundant nectar. It is mucilaginous and slightly febrifuge and is occasionally employed as a domestic remedy.

Bo'rah, WILLIAM EDGAR (1865–), American lawyer, was born in Fairfield, Ill. He was educated in public schools and at the University of Kansas, was admitted to the bar in 1889, practised law in Lyons, Kans., and in 1890 went to Boise, Ida., where he followed his profession until elected U. S. Senator from Idaho for the term of 1907–13. He was re-elected for the terms 1913–19 and 1919–25. Mr. Borah is rated as a progressive if not actually a radical in politics. He was one of the leading Senators opposed to the entry of the United States into the League of Nations and has been noted for his independence in upholding his convictions.

Borås, bo͞o'rōs *or* bo͞o'rôs, town, Sweden, in the province of Elfsborg, on the Wiska River; 36 miles east of Gothenburg. Its inhabitants are engaged in cotton spinning and weaving. Pop. (1921) 28,769.

Bo'rax (Sodium Pyro- or Tetra-Borate, $Na_2B_4O_7.10\ H_2O$) is found in a native, impure state (called *Tincal*) in lake beds in Tibet, India, Persia, Peru, Ecuador, California, and Nevada. The South American mineral consists of boro-natro-calcite ($Na_2B_4O_7.2CaB_4O_7.18\ H_2O$), while that from Western North America is chiefly colmanite, a borocalcite ($CaB_4O_7.4\ H_2O$). The chief sources of supply for the United States are the colmanite deposits in Calico and Death Valley, California, and the deposits in Clark County, Nevada. These latter deposits were discovered in 1921 and constitute the largest known deposit of borax, comprising a hill of pure colmanite 3,000 feet long and from 300 to 500 feet in height. Most of the boracic acid (q. v.) produced in Italy is converted into borax.

Borax forms transparent monoclinic prisms or a white powder, inodorous, of a sweetish, alkaline taste. It effloresces slightly in dry air. It is soluble in 17 parts of cold water, 0.5 part of boiling water, and 1 part of glycerin at 176° F. A solution of borax, when acidified with muriatic acid, turns yellow turmeric paper, after dipping and drying, a brownish red. If a few drops of sulphuric acid are added to a trace of borax or any borate, followed by a little alcohol (especially wood spirit), and ignited, the latter will burn with a green-tinged flame. When heated, borax fuses to a glassy liquid which dissolves metallic oxids, thus serving as a flux in welding and brazing metals by cleansing their surfaces. The solutions of various metallic oxids in borax have characteristic colors; and this peculiarity—known as the 'borax bead' test—is utilized in the analytic identification of certain metals.

Borax is used as a cleansing agent on account of its unequalled detergent properties; also, like boracic acid, in making glazes for pottery, porcelain, and agateware. Medicinally, borax possesses only moderate antiseptic powers. Without being a bactericide, it arrests putrefaction. It is useful as an antiseptic detergent in the treatment of certain inflammatory conditions of the mucous surfaces, as those of the mouth and urinary passages. Its use is prohibited as a food preservative. See Boracic Acid.

Bor'beck, commune, province Rhineland, district Düsseldorf, Prussia, 3 miles northwest of Essen. It comprises the towns of Borbeck, Boschold, Vogelheim, Gerschede, and Dellwig. It is an industrial centre, with blast furnaces, foundries, rolling mills, and machine shops. There are coal mines in the vicinity. Pop. (1910) 59,553.

Borchgrevink, bôr*ch*'gr*e*-vingk, Carsten Egeburg (1864), Antarctic explorer, was born in Christiania, Norway. He emigrated to Australia in 1888; sailed on the *Antarctic* from Melbourne (1894), and was one of the first party to land on the Antarctic continent (Jan. 23, 1895), where he discovered a lichen, the first known vegetation within the Antarctic regions. In August, 1898, he commanded the Southern Cross expedition, organized by Sir George Newnes, reaching latitude 78° 50′ s.—40 miles nearer the South Pole than the previous record by Ross. He made investigations into the volcanic disturbances in the West Indies (1902). He wrote ***First on the Antarctic Continent*** (1901).

Borda, bôr-dä', Jean Charles de (1733–99), French mathematician, astronomer, and naval designer, was born in Dax, France. He visited America and the west coat of Africa to test marine chronometers (1771–6); took part in the American Revolution (1777–8), and was captured and released (1782) on parole by the British. He served later in the French naval department; was engaged in the measurements preliminary to the introduction of the metric system of weights and measures; made important investigations into the pendulum (1790); and was member of a commission for the measurement of a meridianal degree. He wrote ***Description et Usage du Cercle à Réflexion*** (1778), and other works.

Bordeaux, bôr-dō', city, capital of the department of Gironde, France, on the Garonne River; 60 miles from the sea, and 359 miles by rail southwest of Paris. It is the fourth seaport of France.

The harbor will accommodate 1,000 vessels, and there is always a depth of 20 feet of water, while high tide allows vessels drawing 26 feet to reach the deep water floating basin of 25 acres at the north end of the town. Transatlantic steamers stop at Pauillac.

Features of interest are the Roman Amphitheatre, the Church of St. Croix (twelfth and thirteenth centuries), the old Cathedral of St. Seurin (eleventh to fifteenth century), and the Gothic Cathedral of St. André (thirteenth to fifteenth century). The detached bell tower of St. Michael's (354 feet high) is the loftiest spire in Southern France. Besides a university (see Bordeaux, University of), the city has a school for hydrography and navigation (1631), an observatory, a library of 200,000 volumes, and several museums. Statues of Montaigne (mayor, 1581–4) and Montesquieu adorn the Place des Quinconces.

The wines of Bordeaux, both red and white, famed since the fourth century, are of the first importance, while the dependent industries—cooperage, bottle and cork making, and the like—engage a large population. The city also builds railway coaches, manufactures chocolate, sugar, flour, beer, tobacco, glass, textiles, paper, and pig iron, and has breweries and distilleries. Ship-building is also one of the larger industries, the output including naval vessels. Bordeaux sends a fishing fleet annually to the cod fisheries of Newfoundland and Iceland. The trade is principally maritime. The annual value of the combined exports and imports is about $150,000,000, wine and brandy forming about one-third of the exports.

Under the name of Burdigala, Bordeaux was the capital of Aquitania Secunda in Roman times. After devastation by Vandals, Visigoths, Franks, and Normans, it enjoyed a period of peace (1152–1453) under English protection, and passed to Henry Plantagenet on his marriage with Eleanor of Guienne. Here were born Richard ii. of England (1366), Magendie (1783), Joseph Black (1728), Rosa Bonheur (1822), and Desèze (1748). Pop. (1911) 261,678.

Bordeaux, Duc de. See Chambord, Henri Charles Dieudonne, Comte de.

Bordeaux Mixture. See Fungicides.

Bordeaux, University of, was founded in 1441, while the country was under the dominion of the British. At first a self-governing institution, it came under state control under Francis i. In 1808 its organization was reformed under Napoleon; in 1870 a School of Law was added, and in 1878 a School of Medicine and Pharmacy. The University has over 2,500 students, and a library of about 100,000 volumes.

Bordeaux Wine. See Claret.

Bor'den, Sir Frederick William (1847–1917), Canadian public official, was born in Cornwallis, N. S. He was educated at King's College, Windsor, and the Harvard Medical School, Boston, Mass., and began the practice of medicine in Nova Scotia in 1868. In 1869 he became connected with the government military service as assistant surgeon, and later as surgeon and surgeon lieutenant-colonel. He sat in the Canadian House of Commons from 1874 to 1911, except for the years 1883–6. He was appointed Minister of Militia in 1896, and was a member of the Imperial Council of Defence. He was knighted in 1902. He represented Canada at the Imperial Defence Conference in 1909.

Borden, Right Hon. Sir Robert Laird (1854), Canadian statesman, was born in Grand Pré, Nova Scotia. He was admitted to the bar in 1878, and was elected member of the House of Commons for Halifax, N. S., in 1896. He took a leading part in many important debates, and in 1901, upon the resignation of Sir Charles Tupper, was chosen leader of the Conservative Opposition in the House of Commons, being the first Opposition leader to receive an additional allowance voted by Parliament (1905). He was defeated for Halifax in 1904, but was returned for Carleton, Ont., in 1905, and again for Halifax in 1908 and 1911. He defeated Sir Wilfrid Laurier (q. v.) in the general elections of Sept. 21, 1911, upon the reciprocity issue, and became Prime Minister of Canada upon the resignation of the Laurier Government (Oct. 10, 1911). He was appointed to the Privy Council by His Majesty on Jan. 1, 1912.

Premier Borden was the first overseas minister to be summoned to a meeting of the British Cabinet (July 14, 1915). He represented Canada on the Imperial War Cabinet of 1917, and at the Imperial War Conference of the same year, upon his return from which he announced that Canada would adopt conscription (q. v.). In October, 1917, he formed a a Coalition Cabinet, composed about equally of Conservatives and Liberals, in which he himself was Premier and Secretary of State. In the election of December, 1917, he retained the premiership on a platform of vigorous prosecution of the war and enforcement of conscription (see Canada).

Bor'dentown, city, Burlington county, New Jersey, on the Delaware River, at the terminus of the Raritan Canal, and on the Pennsylvania Railroad; 6 miles southeast of Trenton and 27 miles northeast of Philadelphia. It is the seat of the Bordentown Military Institute. Its industrial establishments include foundries, machine shops, worsted mills, shipyards, etc. Joseph Bonaparte, brother of Napoleon I., lived here (1817–32, 1837–9). Pop. (1900) 4,110; (1910) 4,250.

Bordereau, bôr-d'rō', French word meaning invoice, account, or memorandum. It came into prominence in connection with the Dreyfus affair in 1894. See DREYFUS AFFAIR.

Borders, THE, the name associated in history, poetry, and literature with the district lying on either side of the Cheviot Hills, which form in great part the dividing line between England and Scotland. On the English side are Cumberland and Northumberland; on the Scottish Berwickshire, Roxburghshire, and Dumfriesshire. The scenery is somewhat monotonous, with smooth, grass-covered, gently undulating hills, wild moorland, marsh, clear streams, and cultivated valleys; toward the west the hills are more rugged.

Before the Roman occupation, and for centuries afterward, the land was occupied by a Cymric people, who, after a long struggle with the invading Picts, Angles, and Scots, were gradually driven west to the mountains of Strathclyde, the district being occupied by Anglo-Saxon and Norse invaders. It formed part of the kingdom of Northumbria, which, in the tenth century, was brought under the English crown. Malcolm II. of Scotland, after his victory over the forces of Northumbria at Carham (1018), incorporated that portion of Northumbria lying between the Forth and the Cheviots into the Scottish kingdom.

From the close of the twelfth century the border line has been much the same as now. The peaceful times (1214–49) of Alexander II. brought extended culture and commerce. Berwick became one of the greatest seaports in Britain, and Roxburgh and Jedburgh were then important towns. Toward the close of the thirteenth century the Scottish campaigns of Edward I. provoked a state of perpetual warfare on the Borders, which continued with comparatively short intervals of peace down to the union of the crowns. To check these feuds, the Borders were divided in the fourteenth century into East, Middle, and West Marches by the English and Scottish government; and wardens, invested with arbitrary power, were appointed on both sides to keep order. Plundering raids were constantly made from one side or the other through the Cheviot passes and along the valleys of Jed, Teviot, Coquet, Rede, and other streams, the details of which are immortalized in the romantic Border ballads.

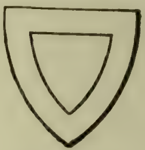
It is chiefly to its ballads, romantic literature, and poetry that the land owes its modern interest. The memory of fairyland and witchcraft remains in *The Young Tamlane* of Thomas of Ercildoune (Earlston), or Thomas the Rhymer, and Hogg's *Queen's Wake* (1813), *Wife of Usher's Well*, and *Gay Gos Hawk*. The poetry of their history includes *Auld Maitland*, *Battle of Otterburn*, *Raid of the Redeswire*, *Jamie Telfer of the Fair Dodhead*, and *Kinmont Willie*. There are songs of pathos in *The Douglas Tragedy*, *Dowie Dens of Yarrow*, *Lament of the Border Widow;* and songs of love and emotion, as well as descriptive poetry, in *John Hay's Bonnie Lassie*, *Ettrick's Banks*, and *Werena my heart licht I wad dee*. Among general collections are Percy's *Reliques*, Herd's *Ancient and Modern Scottish Songs*, Evans' *Old Ballads*, Scott's *Minstrelsy of the Scottish Border*, Jamieson's *Popular Ballads and Songs*, and the collections of Laing, Sharpe, Cunningham, Chambers, and Aytoun. Among the later poetry of the eighteenth and nineteenth centuries are Thomson's *Seasons*, Crawford's poems, Leyden's *Scenes of Infancy*, Hogg's *Kilmeny*, Scott's *Poems*, and Wordsworth's *Yarrow Revisited*.

Consult Skene's *Celtic Scotland;* Rhys' *Celtic Britain;* Wilson's *Tales of the Borders;* Lang's *Sir Walter Scott and the Border Minstrelsy* (1910).

Bordighera, bôr-dē-gā'rä, town and winter resort, province Porto Maurizio, in the West Riviera, Italy, 24 miles by rail northeast of Nice. It consists of the new town next the sea, and the sheltered old town on higher ground inland (winter mean temperature, 52½° F.). The place is famous for its palms and flowers. Pop. 4,500.

Bordone, bôr-dō'nā, PARIS (1500–71), Italian painter of the Venetian school, pupil of Titian, and imitator of Giorgione, is remarkable for his delicate flesh tones and draperies. He succeeded Palma as the fashionable painter of Venice, and was invited (1538–40) to Paris to paint the members of the French court. His chief work, *Fisherman Giving St. Mark's Ring to the Doge* (Venice Academy), is a fine pageant picture.

Bor'dure, or BORDER, in heraldry, an ordinary (though sometimes classed with the subordinaries) which, as its name implies, extends round the edge of the field, on the surface of which it encroaches one-fifth. It was originally used as a mark of 'difference'—*i.e.*, to distinguish the arms of cadets from those of the main line of a house, a function which it still retains in Scottish heraldry—but it is now frequently borne as a charge.



Bordure.

Bore. See TIDES.

Bore. See GUNS.

Bo'reas, the north, or more strictly the north-northeast wind, the coldest in Greece. In ancient legend, Boreas was the brother of Hesperus, Zephyrus, and Notus, and dwelt in Thrace. He was worshipped at Athens.

Bore'cole'. See KALE.

Borel, EMILE FELIX EDOUARD JUSTIN (1871), French mathematician, was born in St. Affrique. He was educated in Paris and became director of scientific studies in the Ecole Normale and professor of mathematics in the University of Paris. His published works include monographs on the *Theory of Probabilities* and the *Theory of Functions; Introduction géométrique à quelques théories physiques* (1914); *Leçons sur les fonctions monogènes uniformes d'une variable complexe* (1917); and a work on *Aviation*, in collaboration with Painlevé.

Borelli, bō-rel'lē, GIOVANNI ALFONSO (1608–79), Italian physician and mathematician, was professor of mathematics at Messina (1649) and at Pisa (1656). He was one of the first to describe the path of comets as a parabola, and he endeavored to explain the motion of the satellites of Jupiter by the laws of attraction. He was also the founder of the iatrophysical school, which attempted to apply mathematics to medicine, as in his *De Motu Animalium* (1680–1).

Borers, wood-boring beetles which feed upon wood, into which they burrow. The most familiar and destructive are the ambrosia beetles, death-watch, and the bark beetles (qq. v.).

Among the oystermen of the Easten United States the name is given to certain small carnivorous gastropod molluscs which bore through oyster shells and kill the oyster by sucking its vital juices. Where these boring molluscs are numerous, great damage is done. Other marine 'borers' are, *Limnoria lignorum* (q. v.), or the gribble, which is very destructive to submerged timber, and *Lithodomus* which penetrates submerged marble.

Borga, or BORGO, tn. prov. Nyland, Finland, Russia, on Gulf of Finland, near mouth of river Borga. It is the seat of a Lutheran bishop, and has a fine cathedral. Trades in furs, wool, and dairy produce. In 1809 the constitution of Finland was framed here. Pop. 4,420.

Borgerhout, suburb of Antwerp, Belgium. Pop. (1900) 37,693.

Borghese, a powerful Italian family which had its origin in Siena. **(1.)** CAMILLO, born at Rome; created cardinal (1596), Pope Paul V. (1605–21); excommunicated the governing bodies of Venice, in which he was opposed by Father Paul (Pietro Sarpi), historian of the Council of Trent; ordered Francesco Suarez to write *Defensio Catholicæ Fidei contra Anglicanæ Sectæ Errores* (1613), a work against the oath of allegiance required by James I. He did much to beautify Rome, and added largely to the Villa Borghese. **(2.)** PAULINE BORGHESE (1780–1825), sister of Napoleon I., after the death of her first husband General Leclerc (1803), married CAMILLO FILIPPO LUDOVICO BORGHESE (1775–1832), who served (1796–1815) in the French army, and became (1805) prince of Guastalla. He sold to Napoleon the museum of the Borghese Villa; its treasures are now in the Louvre. After Napoleon's downfall he severed his connection with the Bonaparte family, separated from his wife, and died at Florence. **(3.)** FRANCESCO BORGHESE, PRINCE ALDOBRANDINI (1776–1839), brother of the preceding, married the Countess Alexandra de la Rochefoucauld, and by her had three sons, of whom CAMILLO (1816) became minister of war in the Papal States (1848).

Borghese Villa, at Rome, until 1902 the summer residence of the Borghese, situated not far from the Porta del Popolo, was built by Cardinal Scipio Caffarelli-Borghese at the beginning of the 17th century, after plans by Giovanni Vansanzio, and has a superb park of nearly 250 acres. It contained formerly a splendid collection of works of art, which was given to Napoleon in 1806 by Prince Camillo Borghese, and of which nearly two hundred pieces went to the Louvre. In 1815 some of them were restored, and after 1820 a new collection of sculptures and pictures was formed. In 1902 the villa, with its picture gallery, and the park, with the buildings it contains, were sold to the Italian state for about $1,300,000.

BORGHESE PALACE, in Rome, the town residence of the Borghese, is situated in the square of the same name. This palace, known also as 'Il Cembalo Borghese,' from its shape, was begun in 1590 from the plans of Martino Lunghi, and finished in 1607 by Flaminio Ponzio, when it was acquired by Camillo Borghese; it is one of the finest buildings in Rome. Besides the picture gallery, there was a collection of art treasures, which were disposed of by public auction in 1892, in consequence of the loss of his fortune by Prince Paolo Borghese (b. 1845). Pope Leo XIII. acquired for the Vatican the important family archives. The picture gallery still contains nearly six hundred paintings, all of first-rate importance, including a *Madonna* by Botticelli; another by Lorenzo di Credi; four paintings by Raphael, including the *Burial of Jesus;* two pictures by Michael Angelo; the celebrated *Sacred and Profane Love* by Titian; *Danaë* by Correggio; and the portrait of *Marie de' Medici* and *Christ on the Cross,* both by Van Dyck.

Borghesi, BARTOLOMMEO, COUNT (1781–1860), Italian archæologist and numismatist, born at Savignano; catalogued the Vatican collection of coins. He resided at San Marino (1821–60). His collection of coins was the best in Italy, and his researches elucidated much of the sacerdotal, military, and political life of the ancient Romans. See his *Nuovi Frammenti dei Fasti Consolari Capitolini* (1818–20). His works were collected in ten volumes (1862–97).

Borgia, CESARE (1478–1507), was the second son of Rodrigo de Borja, a Spanish noble, who afterward became (1492) Pope Alexander VI. Cesare was made by his father archbishop of Valencia, and afterward (1493) cardinal. The Borgias waged a war of extermination against the Orsini, Colonna, Savelli, and other baronial families of the Roman state, whose lands and castles they seized. In June, 1497, his brother, Giovanni Borgia, Duke of Gandia, was murdered, and his body thrown into the Tiber—the crime being instigated, it was said (1498), by Cesare, though historically it has not been proved. Immediately after this Cesare threw off the priesthood and resigned his cardinalate. Proceeding on a diplomatic mission to France, he was made Duke of Valentinois by Louis XII., and in May, 1499, he married Charlotte, sister of Jean d'Albret, king of Navarre. With French assistance Cesare now assailed the towns of Romagna, which refused to acknowledge the supremacy of the court of Rome. Entering Rome in triumph in February, 1500, he was created Duke of Romagna and gonfalonier of the Holy See. He next defeated the Sforzas and Malatestas, and caused the two princes of Faenza to be treacherously put to death. Unsuccessful in attacking Bologna and Florence, he accompanied the French army in the invasion of Naples, when the greatest atrocities and infamies were committed by the invaders. In 1502 Cesare took Urbino and Camerino, where he put to death the Varani, Orsini, and Vitelli. He had now become the terror of all Italy, and contemplated making himself king of the Romagna, the Marches, and Umbria. His father's death by poison in 1503, on which occasion his own life was also (probably) attempted, was the signal for a coalition of his enemies and in 1504 Cesare's forces were defeated, and he was arrested by Pope Julius II., and eventually sent prisoner to Spain. Escaping in 1506, he volunteered in the army of the king of Navarre, and on May 12, 1507, he was killed by a musket shot at the siege of the small town of Viana, near the Ebro. Cesare Borgia was a man of ungovernable passions, and reckless of human life in the pursuit of his ends. With a towering ambition he trampled on all laws, human and divine; yet he was an able administrator, and a patron of art, befriending Pinturicchio and Leonardo da Vinci. Machiavelli's notorious *Il Principe* (1535) was modelled upon Cesare Borgia. His *Life* has been written in Italian by Tomasi (1655), in French by Yriarte (1899), in German by Schubert-Soldern (1902), and in Eng. trans. by Villari (1878–83).

Borgia, LUCREZIA (1478 or 1480–1519), only sister of the preceding, was born at Rome. She married in 1493 Giovanni Sforza, lord of Pesaro; but her father, who had become Pope in 1492, annulled this marriage, and gave her hand in 1498 to Alfonso, prince of Bisceglie, natural son of the king of Naples. Still ambitious for her future, her father and brother caused her second husband to be assassinated; and in 1501 Lucrezia married Alfonso d'Este, son of the Duke of Ferrara, whom he soon succeeded. She now appeared as the patroness of literature, and especially encouraged Bembo, who seems to have indulged a platonic passion for her. Though while at the Vatican she was represented as the sharer with Cesare in all the crime, vice, and licentiousness of the time, nothing is alleged against her after she became duchess of Ferrara. Victor Hugo made her the subject of a drama (1833), and Donizetti the central figure of an opera (1834). Her character has been defended by Roscoe in his *Life of Leo X.;* by W. Gilbert, in *Life of Lucrezia*

Borgia (2 vols. 1869); and by Gregorovius, in *Lucrezia Borgia* (1874).

Borglum, John Gutzon de la Mothe (1867), American sculptor and painter, born in Idaho, studied art in San Francisco and Paris, settled in New York in 1902, and was appointed sculptor for the Cathedral of St. John the Divine (P. E.). His works include the gargoyles on the '99 class dormitory at Princeton, two bronze groups in the Metropolitan Museum of Art, figures, animals, and mural work in painting, and figures, horses, and bronze groups in sculpture.

Borgne, a lake in S. E. La., 12 m. E. of New Orleans in reality a shallow arm of the Gulf of Mexico.

Borgo. (1.) B. San Donnino, tn. and episc. see of prov. Parma, Italy, 14 m. N.W. of Parma. It is identified with the ancient *Fidentia Julia*. Pop. (1901) 12,019. (2.) B. San Sepolcro, or San Sepolcro, tn. and episc. see, prov. Arezzo, Italy, 28 m. N.E. of Arezzo; was the birthplace of the painter Piero della Francesca. Pop. (1901) 9,077.

Borgognone, properly Ambrogio di Stefano da Fossano (?1445–1523), Italian painter, pupil of Foppa and a master of Bernardino Luini, is distinguished by great devotional feeling. He worked as architect and painter for the Certosa, Pavia, where his chief works are to be seen. Among the great masters Leonardo da Vinci was chiefly studied by him, and the effect is distinctly traceable in many of Borgognone's paintings. Among his chief pictures are his *Crucifixion* (1490, Pavia); an altar-piece, *St. Ambrogia* (Milan); an *Assumption* in the Brera in Milan; and in the National Gallery, London, a *Virgin and Child*, *The Two St. Catherines*, *Triptych*, and two portrait groups. See Morelli's *Italian Painters in German Galleries*.

Borgomanero, tn., prov. Novara, Italy, 19 m. by rail N.N.W. of Novara, with silk industries. Pop. (1901), 10,131.

Borgo Pass, in the Carpathians, is in the Hungarian co. of Bistritz-Naszód, and facilitates communication between Bukowina and Transylvania. It lies 3 940 ft. above sea-level.

Borgu, or Bussanga, a native kingdom of W. Africa, partly in the French colony of Dahomey, partly in the British protectorate of N. Nigeria, the latter part forming one of the sixteen provinces of N. Nigeria. It lies W. of the Niger, and immediately N. of 10° N.; is a green and pleasant land, a low plateau of 31,000 sq. m. in area, and is inhabited by Fulbe and Yoruba tribes.

Boring holes in wood is accomplished by means of awls, gimlets, augers, or brace and bits. For making holes in metals rotary drills are used, either in the form of a hand implement or of a special machine driven by power, or in conjunction with a lathe. (See Drills.) Boring mills consist of adjustable cutting tools firmly fixed with reference to a flat circular table on which the casting to be machined is made to revolve by means of a worm arrangement. This method is used in finishing fly-wheels, facing engine-cylinders, etc. Boring into the earth, in prospecting for minerals, is done by hand within limited depths. The surface soil is sunk through by men working in an excavation. On reaching the hard substratum, a chisel screwed on to the end of a solid iron rod is driven down, raised slightly and turned, and then driven down again. As the hole gets deeper a second rod, and then others, are screwed on. After a time the hole is choked, and then the sludger is sent down in place of the chisel. This is a tube with a valve at the bottom, of such a nature that it retains the débris, which is brought to the surface and examined. When the rods become too heavy for the men to lift, they are suspended from a 'spring pole' or latch-tree 30 to 40 ft. long, fixed in the ground with its thin end inclined over the bore-hole; the pole is then started springing, and after each descent the rods are turned. Below depths of 100 yards, a steam engine is used. The drills, which sometimes weigh over a ton, are attached to a wire rope, which passes over a pulley at the top of a derrick and down to one end of a beam, the other end of which is driven by the piston rod. By this means as much as 200 ft. has been bored in twenty-four hours. In gas wells it is customary to sink a casing to nearly the depth of the well, and then put the pipe for gas inside of this. Such construction permits the gas to reach the top of the well without the water, which is forced up through the annular space between gas-pipe and casing. The diamond boring machine, used for hard strata, grinds away an annular hole, leaving a central core which is afterward extracted. Hollow steel rods are used, and diamonds are let in to the grinding face of the lowest. The rods spin round at the rate of three hundred revolutions per minute, and water under pressure is forced down their interior. By this means 50 to 60 ft. may be bored per day in coal-measure rocks. The calyx drill is similar to the diamond, except that saw-teeth of very hard steel are substituted for the diamonds. An ingenious method for surveying the inclination of bore holes is effected by MacGeorge's clinometer. It often happens that the course of the boring is deflected by a hard rock or by a highly inclined stratum. When this is suspected, a number of glass tubes containing melted gelatin are sent down in a special case. At each end of the tube is a bulb, one containing a magnetic needle supported by a float, and the other a small plumb bob similarly supported. The gelatin sets; the apparatus is drawn up; and the angle of inclination, as well as its bearing, can be read off. For books on this subject, see Mining.

Boring Machine. See Drills.

Boris Godunoff (1551–1605), Czar of Russia from 1598 to 1605, was of Tartar origin, and in his youth accompanied Ivan IV., the Terrible, in all his expeditions. Appointed by Ivan one of the council to assist his young son, Czar Theodore I. (1584–98)—who in 1580 married Boris's sister—Boris soon became the real ruler of the country. During this time he made the Russian Church independent of the patriarch of Constantinople by creating the first Russian patriarchate at Moscow; he won over the boyars or nobles by the famous ukase of 1597, by which he virtually converted the peasants into feudal serfs; he completed the conquest and fostered the colonization of Siberia, founding the town of Tobolsk and others; he secured the country against the invasion of the Tartars by fortifying Kursk and other places in the south. The Rurik dynasty becoming extinct through the death of Theodore in 1598, the boyars offered the throne to Boris Godunoff. As Czar, Boris continued his reforms, and endeavored to attract into the country foreign (Western) savants and artisans, and even planned to found a university at Moscow. But in the last year of his reign Russia was ravaged by famine and plague; also by civil war, for a pretender came forward to represent Demetrius, a second son of Ivan IV., whom Boris had put to death. In the midst of this crisis Boris died suddenly (April 13, 1605). His life forms the subject of dramas by Pushkin (1831) and Count Alexis Tolstoy (d. 1876). See Brückner's *Die Europäisirung Russlands* (1888).

Borisoglyebsk, tn., Tambov gov., Russia, 120 m. E.S.E. of Voronej, on the Orel-Tsaritsyn Ry.; important cattle fair in July. Pop. (1897) 22,370.

Borisov, tn., Minsk gov., Russia, on the Berezina, 50 m. by rail N.E. of Minsk; tanneries, breweries, tobacco manufactures. Pop. (1897) 14,931.

Borisovka, bō-rē-sof′kä, town, Russia, in the government of Kursk, on an affluent of the Dnieper; 118 miles south of Kursk. Pop. 20,000.

Borjesson, bûr′yes-on, JOHAN (1790–1866), Swedish dramatist and poet, was born in Tanum. He first became famous as a lyric poet in the school of the Fosforists but in 1820 ceased to write for twenty-five years, and then came forward as a dramatist with his *Erik XIV.* (1846), a fine poem, full of glowing color, and with unusually strong characterization. Its successors, *Erik XIV.'s Son* (1847) and *Solen Sjunker* (1856), did not justify the hopes of the public and the critics. He was chosen a member of the Academy in 1861. His lyrical powers are best exhibited in *Blommor och tarar vid en dotters graf* (1854).

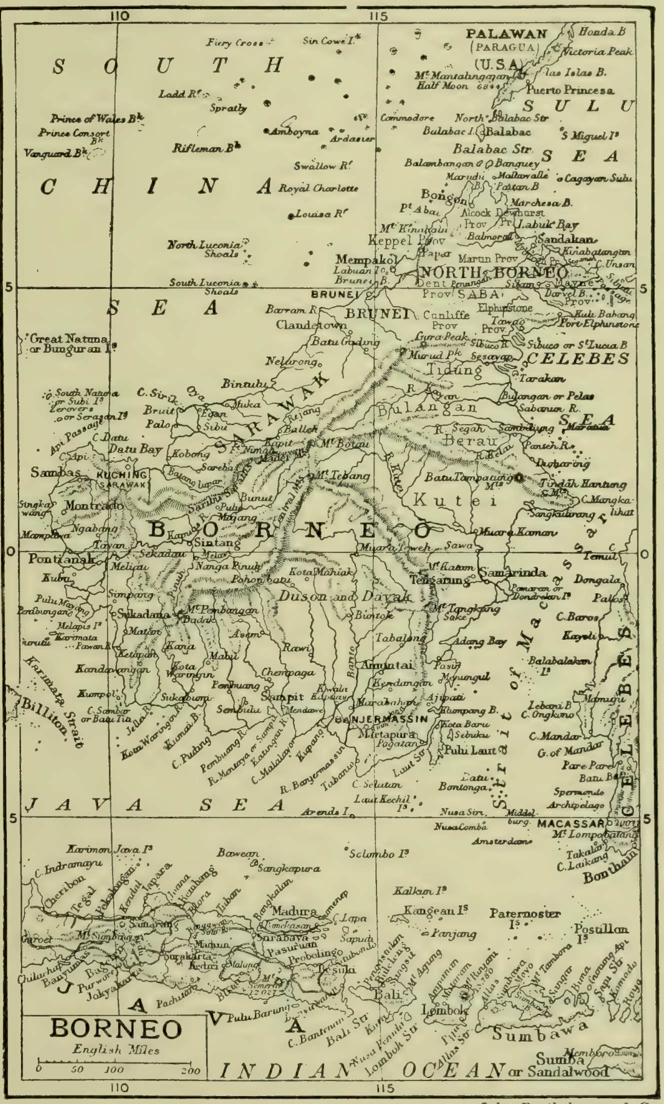
Bor′kum, the largest of the East Frisian Islands, belonging to the Prussian province of Hanover, opposite the estuary of the Ems. It is a popular summer resort and is annually visited by many thousand persons for sea-bathing. Pop. 3,300.

Bor′lase, WILLIAM (1695–1773), English antiquary and correspondent of Pope, was a native of Cornwall. In 1722 he became rector of Ludgvan, near Penzance, and in 1732 was transferred to Saint Just. His most important works are *Antiquities of Cornwall* (1753; 2nd ed. 1769), *Observations on the . . . Islands of Scilly* (1756), and *Natural History of Cornwall* (1758), all illustrated with plates after his own drawings. He presented the whole of his collections to the Ashmolean Museum.

Bormann, bôr′män, EDWIN (1851–1912), German humorous poet, was born in Leipzig. His works were written in classic High German, for example *Schwalbenbriefe* (1885; 19th ed. 1894), *Schwalbenpostkarten* (1885; 31st ed. 1897), *Die Tafelrunde* (1886; 14th ed. 1894); and in the Leipzig dialect (Saxon), for example *Mei Leibzg low' ich mir* (1881; 7th ed. 1898), *Leibz'ger Allerlei* (1884; 8th ed. 1895), *Säck'sche Allerweltsbostkarten* (1892; 7th ed. 1898), *Gemietliche Bostkarten* (1897–8; 17th ed. 1898). In several books—*e.g. Das Shakespeare-Geheimniss* (1894), he also contended energetically for the Baconian origin of Shakespeare's plays.

Bormio, bor′myō, health resort, Italy, in the province of Sondrio, at the foot of the Stilfser Joch, and on the Adda; 35 miles northeast of Sondrio. It is famous for its hot mineral waters (salt and gypsum, temperature 102° F.), which were used by the Romans. The season is July and August. Pop. 2,000.

Börne, bûr′ne, LUDWIG (1786–1837), German author, whose original name was LÖEB BARUCH, was born in Frankfort-on-the-Main. He studied medicine and law, and for some time (1811) held the office of police actuary in his native town, but in 1813 he was dismissed on account of his religion and in 1818 he became a Christian. From 1818–21 he edited *Die Wage*, a review which he had founded and which had attracted attention. In 1830 he went to Paris, where he and Heine became known as the foremost leaders of 'Young Germany.' His love for democracy amounted to a passion. His work, however, is fragmentary and not constructive. His writings include *Briefe aus Paris* (1832–8) which reveal a visionary and impatient temperament, ultra-radical and bitterly satirical; *Menzel der Franzosenfresser* (1837); and *Briefe des jungen Börne an Henriette Herz* (1861), perhaps his most eloquent work. His *Gesammelte Schriften* appeared in 1829–34 (newer ed. 1899). Consult Gutzkow's *Börne's Leben* (1840); Heine's *Ueber L. Börne* (1840); Brandes, *Das junge Deutschland* (1899); Holzmann's *Leben Börnes* (1888) and J. Proels's *Das junge Deutschland* (1892).



John Bartholomew & Co.

Bor′neo, island of the Malay Archipelago, after Australia, Greenland and New Guinea, the largest island on the globe. It is divided politically between the Netherlands and Great Britain, which has also protectorates over Brunei and Sarawak. It is about 690 miles long by 605 miles wide, and has an area of from 263,000 to 300,000 square miles.

The coasts, except in the north, are low-lying and irregular. A series of four mountain ranges, enclosing four tablelands of slight elevation, radiate northeast and southeast from a common centre in the southwest. The chief of these culminates in Mt. Kinabalu (13,455 feet), in British North Borneo. The other ranges have an extreme elevation of 6,000 feet. The mountains and forests contain many monkeys, among which is the orang-outang. Tapirs, a small kind of tiger, small Malay bears, swine, wild oxen or banteng, and various kinds of deer abound. The elephant is only found in the north, and rhinoceros in the northwest. The few domesticated animals are buffaloes, sheep, goats, dogs, and cats. A few horses are seen in Banjermassin. Among the birds are eagles, vultures, Argus-pheasants, peacocks, flamingos, pigeons, parrots, and the swallows (*Collocalia esculenta*) which construct the edible nests prized by the Chinese for making soup. The rivers, lakes, and lagoons swarm with crocodiles, and many kinds of snakes, frogs, lizards, and leeches. Fish are plentiful, and the coasts are rich in tortoises, pearl-mussels, oysters, and trepang. Brilliant butterflies and moths are found in great variety.

Coal is found, notably at Sarawak, Labuan, and Gaya. Gold is obtained in Dutch Borneo; iron in South Borneo; antimony and mercury in Sarawak, and west of South Borneo; other minerals are platinum, silver, tin, copper, zinc, lead, and sulphur. There are also rich oil-wells particularly in Dutch Borneo, where they have proved an important aid to wealth and prosperity. Diamonds and gems are obtained in West and South Borneo, notably at Landak.

Borneo is traversed by several large rivers, of which the most important are the Kapuas, the Kinabatangan, and Barito. They are mostly steep and torrential in their upper courses, but nearer the sea they overflow, and form wide, swampy marshes and lagoons (*danaus*). Of the interior little is known, except that it is covered with primeval forests yielding valuable timbers (teak, ebony, ironwood and sandalwood), gums and resins (india-rubber, gutta-percha, and camphor), rattans, fibres, benzoin, spices (cloves, pepper, camphor, etc.), and magnificent flowers (orchids, pitcher plants and rhododendrons). On the whole the surface is fertile, and without much cultivation produces abundance of food stuffs. The climate is hot and humid, the average temperature in South Borneo being 82° F., and in North Borneo 95° F.; the rainfall is heavy.

Trade in raw products (edible birds' nests, sago, fruits and gums), and in manufactured wares, rice, and food stuffs, is carried on, principally with Batavia, Singapore, and Hongkong, by Arabs, Chinese, Malays, and Europeans. The rubber industry is increasingly important and an adjunct of prosperity. The population is estimated at about 2,500,000. It consists of three classes: the Dayaks or Dyaks, who are the aboriginal heathen inhabitants, and constitute the great bulk of the population; the Mohammedans or 'Malays'—for this name is extended so as to include all professors of Islam, whether true Malays, Buginese, Javanese, Dyaks, or Arabs; and the Chinese. The Dyaks live chiefly in the interior, and employ themselves with tillage and the collecting of gutta-percha, resin, gums, ratans, gold-dust, and wax. They are divided into numerous tribes. The Malays (taking the name ethnographically) dwell on the coasts, are traders and bold sailors. They are more civilized than the Dyaks, cultivate the grounds around their houses, lay out gardens, keep cattle, and live partly by fishing. The Chinese, chiefly from Canton, have penetrated far into the interior.

The European history of Borneo begins with its discovery by Lorenzo de Gomez in 1518. The Portuguese first opened up commerce, and were followed by the Spaniards. Early in the 17th century the Dutch established themselves in South Borneo. The English soon followed, but were later driven out, and it was not till the 19th century that British influence was again felt, this time in North Borneo, where in 1842 Sir James Brooke established the independent territory of Sarawak, now a British protectorate.

British North Borneo has a coast-line of over 900 miles, and an area of 31,106 square miles. The chief exports are rubber, timber, tobacco, copra, coal and cutch. There are 125 miles of railway, with 20 miles additional in Sarawak. The capital is Elopura or Sardakan; pop. (1921) 11,936. It is administered by a company, incorporated by royal charter, Nov. 1, 1881. Brunei lies southwest of British North Borneo; it has an area of about 2,500 square miles, and a population (1921) of 25,444. It is governed by a native sultan under British protection. Sarawak has an area of about 42,000 square miles, and an estimated population of 600,000. Kuching, about 23 miles up the Sarawak River, is the capital and chief town. Pop. of British North Borneo (1921) 257,804.

Dutch Borneo is divided administratively into (1) West Borneo (area 56,838 square miles), with a pop. of (1920) 605,402—chief town Pontianak; (2) East and South Borneo (area 149,972 square miles), with a pop. (1920) of 1,020,599—chief town Banjermasin. Within these are several native states, more or less subject to the Netherlands. The chief exports are timber, oil, coal, diamonds, gutta-percha, copra and rubber. There are a few good roads in South Borneo.

Consult Furness' ***Home Life of*** *Borneo Head-hunters;* Rutter's *British North Borneo* (1922); *Handbook of the Netherlands East Indies* (1924); Owen's *British North Borneo* (1926); Hose's *A Record from Borneo* (1927); Krohn's *In Borneo Jungles* (1927).

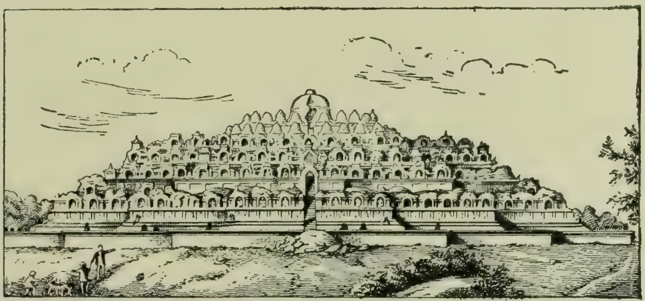
Born′holm (abbreviated from *Borgundarholm*), a Danish island in the Baltic, about 25 miles from the southern point of Sweden; area, 225 square miles. Geologically it is the southeastern spur of the Scandinavian granite formation. It is well wooded, and has a rich vegetation. Kaolin and other fine clays, in which the island abounds, originate the chief industries. During the Viking and early Middle Ages it was one of the principal trade centres in the Baltic, and indeed in the north. During the 16th century it was ravaged repeatedly by the Hanseatic League, and suffered greatly during its temporary domination by Lübeck (1525–75), and also under Swedish rule (1654–8). Since 1660 Bornholm has been incorporated with Denmark. The chief town is Rönne. Pop. (1920) 43,600.

Bornu, bôr-nōō′ (57,000 sq. m.), province, formerly a negro kingdom, Nigeria, Central Africa, lying west and south of Lake Chad. It was explored in 1822 by Denham and Clapperton. A large part of the country is perfectly level, and is liable to be overflowed in the rainy season which lasts from October to April. The heat from March to June is excessive, ranging from 104° to 107° F. A large portion of it is exceedingly fertile, especially the regions bordering the rivers Shari and Komadugu, feeders of Lake Chad.

The capital, Kuka or Kukawa, a most important trading centre, lies close to the w. shore of the lake, and has a population of about 60,000; the former capital (15th century to 1809), Birnie, is now almost in ruins. The Kanuri race is predominant, the others being Tuaregs, Tibbus, Haussas, and Arabs. Mohammedanism is the adopted religion. Trade is done in cotton, indigo, ivory. ostrich feathers, skins, the Shea butter-nut, leather. Pop. 4,000,000. Bornu, formerly a part of the kingdom of Kanem, was founded as an independent state shortly after the middle of the 15th century, but declined again early in the 17th. This continued till the end of the 19th century, when its territories were appropriated by France, Great Britain, and Germany. See Barth's (1857) and Nachtigal's (1881) *Travels;* also *Nigeria, Our Latest Protectorate* (1900), and other works cited under NIGERIA.

Boroach. See BROACH.

Boro-Budur, ruined Buddhist temple in Central Java, E. Indies; stands beside the Praga R., 15 m. N.W. of Jokjokarta. It consists of six square platforms superposed one upon another, and upon the topmost of them stands a lofty cupola, immediately surrounded by three concentric circles of bell-shaped cupolas. The bottom platform measures 500 ft. by 500 ft., and the total height is 118 ft. The edge of each of the platforms is protected by a balustrade of highly ornamental sculpture, and has midway an open-work cupola sheltering an image of Buddha. In addition to this there are a great number of smaller niches, each filled with a representation of Buddha, and a series of over 2,000 bas-reliefs depicting various incidents in the history of the same divinity. See Leemans's *Bôrô-Boedoer,* with nearly 400 plates (1873), and Crawfurd in *Trans. of the Lit. Soc. of Bombay,* vol. ii. (1823).



Boro-Budur Temple, Java.

Borodino, vil., Moscow gov., Russia, 72 m. w. of Moscow, on Kaluga R., trib. of Moskwa, celebrated for Napoleon's victory over the Russians under Kutusoff in 1812. In the battle the Russians lost 50,000, and the French 30,000.

Boron (B,11), an element found in combination in boric acid, tincal or native borax, boracite, and other minerals. It is a dark-brown powder procured by heating boron trioxide (obtained by heating boric acid) with magnesium powder, and is of no commercial value. Several of its compounds, such as boracic acid and borax, are, however, used in medicine and the arts.

Bororos, a S. American people who occupy a vast domain of about 270,000 sq. m. in the Brazilian states of Matto Grosso and Goyaz. They were reduced about 1650 by the Portuguese. They are a tall race like the Tehuelches (Patagonians), of whom they are regarded by some ethnologists as the parent stock.

Borough English. An ancient English tenure in which lands descend not to the oldest son, as is the rule of the common law, but to the youngest. The custom still exists in some parts of England and the Continent, and appears to be a survival from a primitive system of law, no other traces of which exist.

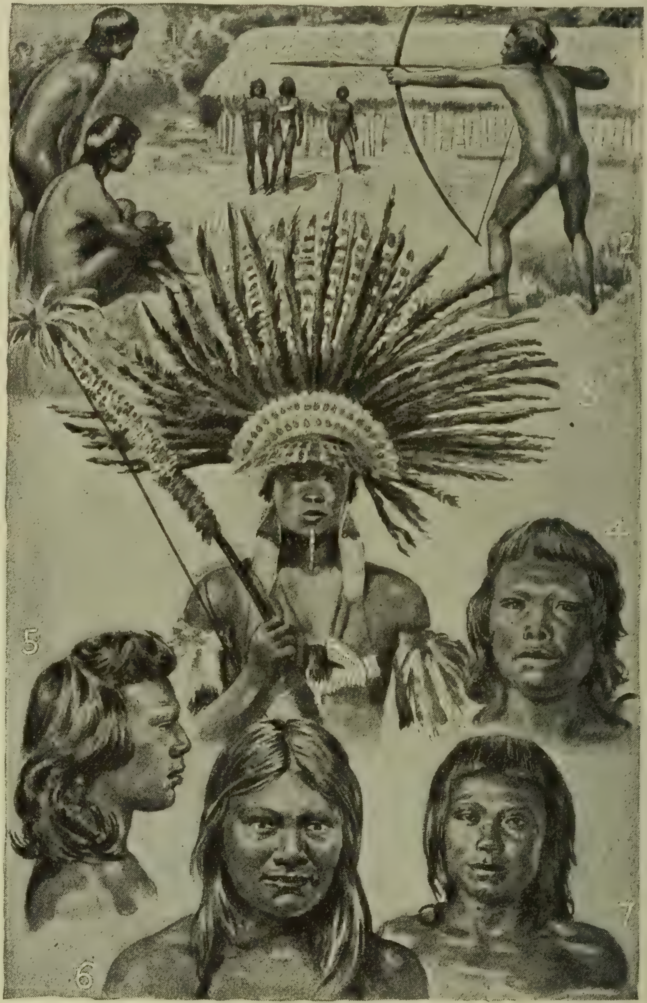
Borromean Islands, four small islands in Lake Maggiore, Italy, opposite to Pallanza. Isola Bella ('Beautiful Isle') was in 1650–71 converted by Count Vitaliano Borromeo and Cardinal Giberto, his brother, from a bare rock into a rich terraced garden, and crowned with a splendid specimen of an Italian 17th-century baronial palace. Isola Madre ('Mother Isle') has a botanical garden and an 'English park.' The other two islands are Pescatori (Fishers' or Upper Isle) and San Giovanni (St. John).

Borromeo, CARLO, COUNT (1538–84), cardinal and archbishop of Milan, was born at Arona, on Lago Maggiore. His uncle, Pope Pius IV., called him to Rome, and made him (1560) a cardinal and archbishop of Milan. He established an academy in the Vatican for the promotion of learning. When the Council of Trent terminated its labors in 1563, Borromeo was commissioned to draw up the famous exposition of Roman Catholic doctrines known as the *Catechismus Tridentinus.* Borromeo enforced much-needed reforms upon the clergy and the monastic orders, and himself led the way by his saintly and humble life and his benevolence to the poor. A monk of the order of the Umiliati attempted (1569) the cardinal's life. Borromeo visited all parts of his diocese, reforming abuses, and establishing colleges, schools, and asylums for destitute children. He founded (1570) the Helvetic College at Milan, and during the plague in that city in 1576 personally visited the sick and relieved the poor. It was through Borromeo that the Golden League—an alliance of the seven Catholic Swiss cantons —was founded for the united defence of the faith. Borromeo was canonized in 1610 by Pope Paul V. A colossal bronze statue was erected (1697) to his memory near his birthplace, on the west bank of Lago Maggiore. His *Works* were published in 1747, and his *Life* has been written by Guissano (Eng. trans. by Cardinal Manning, 1884) and Sylvain (1884).

Borrow, GEORGE HENRY (1803–81), English philologist, traveller, and author, was born at East Dereham, Norfolk. His father rose from the ranks to be captain and adjutant in the W. Norfolk Militia. His mother, Ann Parfrement, was of Huguenot (not as is sometimes stated, of gypsy) blood. Borrow's life is sketched in a romantic spirit, with the suppression of real names and places, in *Lavengro* and *The Romany Rye.* His boyhood was spent wandering with the colors; and voluntary studies in French, Italian, and Spanish, as well as the lore of boxers, horse-coupers, and gypsies, supplemented a scanty education picked up at the High School, Edinburgh, and Norwich Grammar School, and elsewhere. In 1819 he was articled to a solicitor, but continued to study philology, and obtained some sort of acquaintance with about twenty tongues. His chief associates were John Thurtell, afterward hanged for murder; and William Taylor of Norwich, whose moral influence upon him was thoroughly bad. In 1824 he went to London, where he supported himself by hack work. In 1825 came the famous ramble through England, immortalized in *Lavengro.* Between 1826 and 1833 little is known of Borrow's life. During this time he seems, with the exception of a journey (1826–7) through France and Spain, to have been working for booksellers in London and Norwich. In 1832 he was made an agent of the British and Foreign Bible Society, and was sent by it to St. Petersburg (1833) to superintend the printing of the New Testament in Manchu. In 1835 he went as the society's agent and colporteur to Portugal and Spain, and at this work he spent five years. In 1840 he married and settled near Lowestoft. Here Borrow began the literary period of his career with *The Gypsies in Spain* (1841). This was followed by *The Bible in Spain* (1843); and then he set to work on the autobiography, which was much delayed—*Lavengro* appearing in 1851, and *The Romany Rye* in 1857. Leisure increased his nervous troubles, so in 1844 he travelled through Europe as far as Constantinople. In 1853 he moved to Great Yarmouth, and began a series of peregrinations through the British Isles, one of which resulted in *Wild Wales* (1862). In 1860 he moved again to Brompton, but in 1874 he returned to Oulton, where he died. His *Romano Lavo-Lil* (Gypsy Word-Book) appeared in 1874. Borrow's philology was thoroughly superficial; but his vivid and adventurous imagination, his passion for 'the wind on the heath,' and his uncompromising and intolerant Protestantism, give a unique fascination to the records of his journeyings. Works: New and in some cases enlarged editions of *The Bible in Spain* (1899), *Lavengro* (1900), *The Romany Rye* (1900), *The Gypsies in Spain* (1901), *Wild Wales* (1901). Biography: *Life, Writings, and Correspondence*, by W. I. Knapp (1899), with full bibliography; *George Borrow in E. Anglia*, by W. A. Dutt (1896); and T. Watts-Dunton's papers in *Athenæum*, Sept., 1881.

Borrowdale, eccles. par. (ac. 16,666) and tnship., par. of Crosthwaite, W. Cumberland, 5 m. s. of Keswick. Plumbago mines. The name also applies primarily to the valley itself, stretching from Glaramara Mt. along the river Derwent between the 'Jaws of Borrowdale,' to the s. end of Derwentwater. It contains the famous 'Bowder Stone.'

Borrowing. A gratuitous bailment in which one person receives personal property from another with the obligation to return it on demand or at a specified time. A borrower is held to strict accountability for his use of the property entrusted to him and is liable for even slight negligence resulting in damage thereto. Like other bailees, however, he is entitled to protect his possession against strangers interfering therewith and may maintain an action for the full value of the property against any one who destroys it or wrongfully deprives him of it. The term borrowing is popularly employed, also, to describe the receiving of money or other property not to be returned *in specie* but only in kind. This is not properly a bailment, but a transaction of barter or sale, in which the title to the property, and not a mere right of possession, passes to the borrower. In such case the borrower may make any use he pleases of the borrowed property, his obligation being limited to the debt created by the loan. See BAILMENT; BARTER; SALE.



The Bororos of South America.

1. Young men's house. 2. Shooting with the bow. 3. Chief, with headdress of macao feathers. 4. Bororo man; 5, profile. 6. Woman. 7. Boy.

Borrowstounness, or BO'NESS, par. (ac. 5,939) and seapt., bur. of barony and pol. bur., on s. shore of upper part of Firth of Forth, Linlithgowshire, Scotland, 3 m. from Linlithgow. It has coal mines and iron works, brickfields and potteries, distilleries, salt refineries, fishing and shipbuilding, and a considerable trade in pit props with Scandinavia and Finland. Remains of Antoninus's Wall, locally known as Graham's Dyke, are near. Pop. of tn. (1911) 10,866; of par. 14,034.

Borsna, bôrz′nä, town, Ukraine, in Chernigov government, on a sub-affluent of the Dnieper; 51 miles southeast of the city of Chernigov. It has tanneries and tobacco culture. Pop. 13,000.

Borsod, bōr′shōd, county of Hungary, stretches northwest from the middle course of the Tisza (Theiss), and is crossed by its tributary the Sajó, and by the Bükk Mountains. Nearly one-half of the surface is covered with forest, but the rest produces first-rate wine, wheat, maize, tobacco, hemp, and fruit. Copper, coal, and iron are mined, and marble is quarried. Area 1,355 square miles.

Borszék, bōr′sāk, health resort, Roumania, formerly in Hungary, in a valley of the Carpathians, 60 miles northeast of Maros-Vásárhely. It has nearly a dozen springs, and the water is exported in considerable quantities. Pop. about 1,700.

Bortnyanski, bôrt-nyän′skē, Dmitri Stepanovitch (1751–1825), Russian composer, was born in Glukhov. He was sent by the Empress Elizabeth to Italy, and there studied for eleven years. Returning to Russia (1779) he was appointed composer for the court choir, which subsequently became the Imperial Capella, with Bortnyanski as its director (1796–1825). He composed two operas, *Creonte* (1776) and *Quinto Fabio* (1778), but is distinguished primarily for his religious compositions, which marked an epoch in Russian musical history. His works were edited by Tschaikowsky in ten volumes.

Bory de Saint Vincent, bō-rē′ *de* saṅ-vaṅ-säṅ′, Jean Baptiste Georges Marie (1780–1846), French geographer and naturalist, was born in Agen. He explored Bourbon, Réunion, and St. Helena (1798–1802); fought at Austerlitz, in Spain, and at Waterloo. After editing scientific and other journals in Belgium and France, he was appointed leader of a scientific expedition to Morea and the Greek islands in 1829, and president of the scientific commission for the exploration of Algeria in 1840. His works include: *Essai sur les Iles Fortunées* (1803), *Voyage dans les Quatre Principales Iles des Mers d'Afrique* (1804), *Expédition scientifique de Morée* (1832), and *L'homme, essai zoologique sur le genre humain* (1836).

Boryslaw, bō′rē-slöf, town, Poland, in Galicia, at the north foot of the Carpathians, 6 miles southwest of Drohobycz. It is a centre of the petroleum and ozocerite industries. Pop. about 9,000, mostly Jews.

Borysthenes, bō-ris′thi-nēz, the modern Dnieper. Near its mouth lay the town called by the same name, and also Olbia, Olbiopolis, and Miletopolis, which was a colony from Miletus, founded in the 6th century B.C., and the most important town on the north of the Black Sea, especially for export of corn.

Borzhom, bōr-zhom′, health resort, Russia, in the Caucasus, on both banks of the Kura, 18 miles from Mikhailovo. It is beautifully situated in the hills, and its mineral springs are famous. Remertovski and Vorontzóv Parks are interesting. Pop. about 6,000.

Borzoi, bôr′zoi, or Russian Wolf-Hound, a hound of the general size and shape of the greyhound, but having a long silky and somewhat curly white coat, sometimes spotted with black or tan. It is a beautiful high-bred animal, generally, with a good disposition, although it is occasionally inclined to be quarrelsome. In Russia the borzoi is used for hunting wolves, being trained to run alongside a fleeing wolf, seize him by the neck, and hold tenaciously until the hunter arrives. The dog has been introduced into England and America in comparatively recent years, the first specimens in England having been presented by the Tsar to the Prince of Wales in 1870.

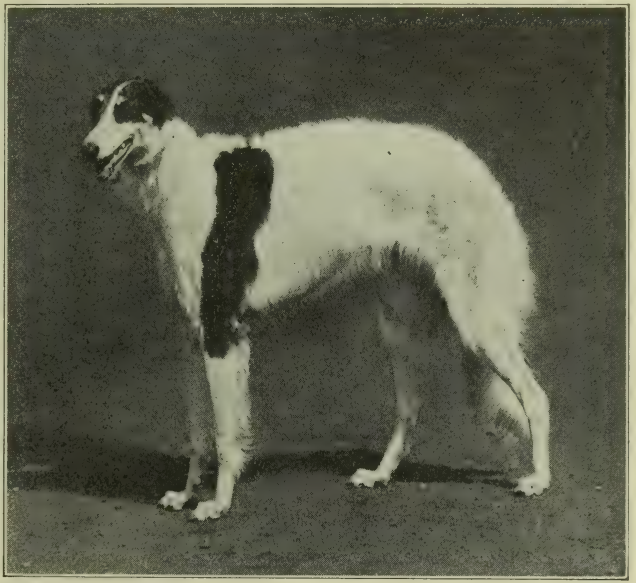


Photo by Edwin Levick, N. Y.

Borzoi, or Russian Wolfhound

Bosanquet, bōs′säṅ′kā′, Bernard (1848–1923), English philosopher, was born in Alnwick and was educated at Harrow and at Oxford. From 1871 to 1881 he was lecturer at University College, Oxford, and from 1903 to 1908 he was professor of moral philosophy at St. Andrews. His publications include *Logic or Morphology of Knowledge* (1888); *Civilization of Christendom* (1893) *Essentials of Logic* (1895); *Psychology of Moral Self* (1904); *Philosophical Theory of the State* (1912); *Implication and Linear Influences* (1919); *What Religion Is* (1920); *The Meeting of Extremes in Contemporary Philosophy* (1921).

Bosboom - Toussaint, bos′-bōm-tōō-saṅ′, Anna Louisa Gertruida (1812–86), Dutch novelist, was born in Alkmaar, and spent most of her life (1851–86) at the Hague. She was the wife of the painter Jan Bosboom. She wrote principally historical novels, showing remarkable insight into human nature, combined with wide and accurate knowledge of the past. Good specimens of her work are *Het huis Lauernesse* (1841; 10th ed. 1885), *Graaf van Devonshire* (1838), *Engelschen te Rome* (1840) *Leycester in Nederland* (1846), *Vrouwen van het Leycestersche Tijdperk* (1849), *Gideon Florensz* (1854)—all historical novels. Her social novels, as *De Delftsche Wonderdokter* (1871) and *Majoor Frans* (1875), are less successful. Her collected novels appeared in 25 volumes in 1880–8. There is a *Life* in Dutch by Jan ten Brink.

Boscan-Almogaver, bōs-kän′äl-mō-gä-var′, Juan (*c.* 1495–1542), Spanish poet, was born in Barcelona. He served as a soldier in Italy until 1519, when he returned to Spain, and became tutor (1520–6) to the great Duke of Alva. His earlier compositions are in the old Castilian measures, but he was induced by the Venetian ambassador Navagiero to adopt the Italian hendecasyllabic metre in 1526, and was mainly instrumental in changing the fashion of Spanish verse. For the rest of his life he closely imitated the verse forms of the Italian poets, especially Tasso. He also translated excellently Castiglione's *Cortegiano* (1534; new ed. 1873). Most of his poetic works were published after his death with those of his friend Garcilaso de la Vega (1st ed. Barcelona, 1543). A good edition of Boscan's alone, with a biography by W. I. Knapp, appeared in Madrid in 1875.

Boscawen, bos'ka-wen, Edward (1711–61), British admiral, known as 'Old Dreadnought,' was the third son of the first Viscount Falmouth. He distinguished himself at the taking of Porto Bello in 1741. In 1744, when in command of the *Dreadnought*, he assisted in the capture of the French ship *Médée*, and in 1747, after commanding the *Namur* in the action off Finisterre, where he was wounded, he became a rear-admiral. Having subsequently rendered useful service in India, he became a lord of the Admiralty in 1751, and a vice-admiral in 1755. He effected the reduction of Louisburg and Cape Breton Island in 1758, and in the following year chased and destroyed a French squadron under De la Clue off Lagos. In 1758 he attained the rank of admiral, and in 1760 was made general of marines.

Bosch, Jerom. See Æken.

Boscobel, parish, England, in Shropshire, famous as containing the farmhouse where Charles II. hid after his defeat (1651) by Cromwell at Worcester. The Royal Oak in whose branches the king concealed himself for twenty-four hours no longer stands, but a tree said to have been grown from one of its acorns commemorates the event.

Boscoreale, bos'kō-rā-ä'lā, city, Italy, in the province of Naples, at the foot of Mt. Vesuvius, 2½ miles north of Pompeii. Here in 1895 treasures of silverware and domestic utensils, and two years later, a villa with general offices, a wine press, and household furnishings were excavated.

Boscovich, bos'kō-vich, Ruggiero Guiseppe, or Roger Joseph (1711–87), Italian mathematician and astronomer, was born in Ragusa. He entered the Jesuit order in 1725, was appointed professor of mathematics and philosophy at the Roman College, about 1740, and was commissioned by the Pope to measure a degree of the meridian in the Papal States, an account of which was published in 1755. After holding university appointments at Pavia and Milan, he was appointed director of optics to the French navy (1774–83). His chief works are *Elementa Universa Matheseos* (3 vols. 1754), *Opera Pertinentia ad Opticam et Astronomicam* (5 vols. 1785), and a long Latin poem, *De Solis ac Lunæ Defectibus* (1764). He died insane.

Bosio, bō'zyō, François Joseph, Baron (1769–1845), French sculptor, was born in Monaco. He executed bas-reliefs for the column in the Place Vendôme at Napoleon's request; was made royal sculptor by Louis XVIII; and was created baron by Charles X. His best-known works are *Cupid Darting Arrows* (1808); *Henry IV. as a Child; Aristée, Dieu des Jardins* (1811), in the Louvre; *Hyacinthe* (1817), also in the Louvre; and an equestrian statue of *Louis XIV*. (1824), in the Place des Victoires, Paris. He also executed busts of Napoleon I. and members of his family, of Louis XVIII., Charles X., and others.

Bosjesman. See Bushmen.

Bosna, bos'nä, a river of Bosnia, in the Balkan Peninsula, rises south of Sarajevo, winds northward past that town, and enters the Save from the right at Samac after a course of 125 miles. It is navigable for about two-thirds of its length, as far up as Vranduk.

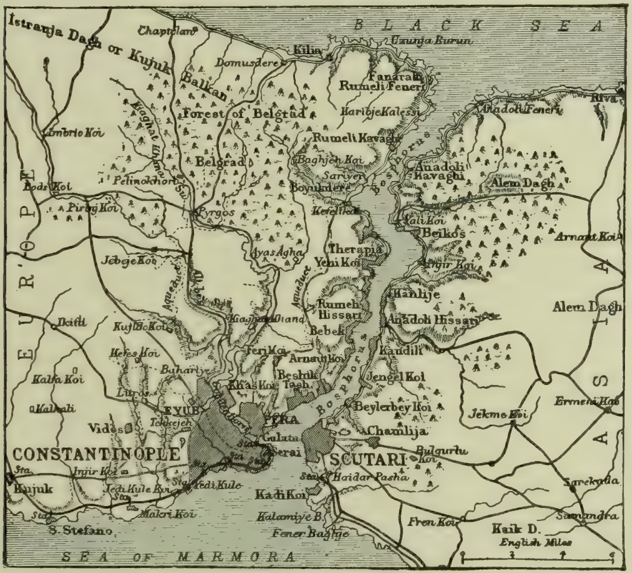
Bosna Sara. See Sarajevo.

Bosnia-Herzegovina, boz'ni-*a* her'tse-gō-vē'n*a*, district of Jugoslavia, including the provinces of Bosnia and Herzegovina, formerly provinces of Turkey, and from 1908 until the Great War, of Austria-Hungary. It is situated in the northwestern part of the Balkan peninsula, bounded on the north by Croatia and the river Save, on the east by Servia and Montenegro, and on the south and west by Dalmatia and the Adriatic. It has an area of 19,768 square miles. The climate is moist and temperate, but the winters are severe, particularly in Herzegovina. In general it is mountainous and picturesque, over half the area, especially Herzegovina, being covered with forests. The principal rivers are the Save, the Bosna, the Una, the Drina, the Narenta and the Vrbas. Bosnia-Herzegovina is rich in natural resources; minerals, including coal, iron, copper, silver, lead, salt, and manganese occur abundantly in the mountains, and forests of fir, pine, oak, and beech cover the central part. Agriculture is the leading industry; live-stock raising is important, and the rivers are full of fish. The valleys are extremely fertile, and cereals, fruits of all kinds, vegetables, dairy products, and tobacco are produced. Manufacturing is undeveloped, being confined chiefly to chemicals, iron and leather goods, coarse textiles, and carpets. The chief exports are fruits, live-stock, and timber; the imports, food-stuffs and textiles. For administrative purposes Bosnia-Herzegovina is divided into 6 districts named for the important towns, all but one of which are in Bosnia. The people are mostly of Serbian blood; about two-thirds of them are Christians, the rest Mohammedans. Education is in a backward state. Sarajevo, with a population of 50,000, is the capital. Pop. (1920) 1,889,929.

History.—After forming successively part of Illyria, Pannonia, and Dalmatia, Bosnia was peopled in the 6th and 7th centuries by Slavs. Then for eight hundred years it was subject successively to Serbia, Croatia, and a line of native kings, until, in 1463 Bosnia, and in 1483 Herzegovina was subjugated by the Turkish sultan Mohammed II. Thereafter it played an important part in supplying the famous Janissary corps of the Turkish armies. In 1849–50 and in 1875 the peasantry, who mostly clung to their Roman Catholic faith, rose in revolt against their masters (countrymen of their own whose ancestors accepted Mohammedanism in order to retain their estates) and against their Turkish rulers. In 1878 the Berlin Congress gave Austria a mandate to occupy and administer Bosnia, Herzegovina, and the sanjak of Novi-Bazar, under the suzerainty of Turkey, and in 1908 Austria annexed all three. In 1914 the assassination of Archduke Ferdinand in Sarajevo, the capital, precipitated the Great War, at the close of which the provinces of Bosnia and Herzegovina were alloted to the newly formed state of Jugoslavia (1918). Consult Munro's *Rambles and Studies in Bosnia-Herzegovina;* Nikaschinovitsch's *Bosnia und die Herzegowina* (4 vols.); Olivier's *La Bosnie et l'Herzegovine;* Stoianovitch's *Bosni-Herzêgovina* (1917); British Foreign Office *Handbook No. 12* (1920).

Bosporus, bos'pō-rus (also Bosphorus), or Straits of Constantinople, strait, Turkey, separating Europe from Asia, and connecting the Black Sea with the Sea of Marmora. Its length is 17 miles, and its breadth is from a mile to 2 miles. Its well-wooded shores are elevated and picturesque, with many bays, the most important of which is the Golden Horn. The towns of Scutari, Pera, Therapia (the castles of Europe and Asia), and the city of Constantinople stand on the strait. By the Treaty of Berlin (1878) it is stipulated that no warships except those of Turkey are allowed to pass through. (See Dardanelles.)

The Cimmerian Bosporus (the Straits of Kaffa), between the Sea of Azov and the Black Sea, was called after the Cimmerii (q. v.), who were supposed to have lived there. On the west side of the strait, in the modern Crimea, the Milesians founded a colony in the sixth century B. C., called Bosporus or Panticapæum, the modern Kerch. From the fifth century B. C. it had a dynasty of its own, and its kings were in active communication with Athens, especially in the time of Demosthenes. But in 115 B. C. the last king, being hard pressed by the Scythians, ceded it to Mithridates vi. of Pontus, to whose son Pharnaces it was given by Pompey in 63 B. C. The kingdom was destroyed in the third century A. D. by the Goths.



The Bosporus.

Bosquet, Pierre François Joseph (1810–61), French marshal, was born in Mont-de-Marsan, Landes. He served in numerous campaigns in Algiers (1834–52), and fought with distinction at the Alma and at Inkerman, and in the storming of Sebastopol, in the Crimea (1854–5). He was promoted field marshal and was appointed senator.

Bosruck, Alpine tunnel of Austria, on the Pyhrn Railway, affords direct communication between Bohemia and the Adriatic. The tunnel (opened 1905) is 3 miles long; its summit elevation, 2,405 feet above sea level.

Boss Rule. In our present usage of the terms, the 'boss' differs from the political 'leader' in that the latter keeps ever foremost the highest welfare of the country, and uses only methods that will be morally helpful to the voters; while the boss advances primarily his own power by serving special interests—frequently by methods that are considered immoral and corrupting to the voters.

Boss rule is probably dependent primarily upon the indifference and mental inertia of the average voter. The large majority of voters have drifted into their political parties on account of their early environment and personal relationships. Not being persons of initiative or great independence of judgment, they naturally remain in the party regardless of changing policies. They follow the leader, adopting whatever plans and methods he puts forward. Usually their motives are not corrupt; they are simply blind followers.

In order to secure and maintain his position, the boss must be skilful in serving the special interests that have influence in the community, wealth to furnish means for his political plans and to reward him for his services. In order to maintain the confidence of these interests, and of the voters, he must be straightforward in his dealings with those from whom he, directly or indirectly, receives his pay, and with the subordinate leaders who serve under his direction. He must be skilful in putting before the voters plausible reasons for his plans, and must maintain the appearance, at least, of service to the public. Doubtless in many cases where his own interests, or those of the few whom he is serving, are not at stake, he gladly promotes the public interest.

The boss must have ability in leadership. He must be a man who can stimulate the imagination of his followers, who has great organizing ability, and who understands human motives. Even the greatest and most unscrupulous bosses maintain their power largely by direct personal attention and actual kindnesses to their followers, frequently giving presents to wives and children attending weddings and funerals, organizing picnics and excursions, giving liberally to charity, and ministering to the personal wants of their followers, thus winning their real affection. They promote their interests by furnishing jobs to a large number of workers, often on public improvements, by distributing patronage of the higher offices to their leading followers, and by similar methods. Sometimes the work that they do is not contrary to the public interest; but much of it may be injurious, and the purpose of the boss is primarily selfish rather than patriotic.

The effects of boss rule are distinctly evil. First, the methods of the boss are likely to render the voters even more indifferent to the public needs, and more inclined to use public positions for private gain. Such rule is destructive of patriotism. Second, a skilful boss by controlling the voters in the interests of a few, if he wields his power successfully and it is long continued, often discourages many good citizens who feel that time devoted to the public service is wasted, as nothing permanent can be accomplished. And, third, such rule is very expensive to the public, as not only are its interests not served, but the revenues go largely into private pockets.

The remedies for the evils of boss rule must be found—first, in an aroused public opinion that comes from knowledge of actual conditions, the public thus seeing how their interests are sacrificed; second, and no less important, from an aroused public conscience which will compel citizens to perform their civic duties at the sacrifice of personal comfort, and even of personal interests.

This civic conscience will compel able men to be willing to lead unselfishly in public affairs, and to esteem it a privilege to have the opportunity of serving the public. No less must it stimulate the ordinary voter whose time, owing to the necessity of earning a living, cannot be so readily commanded, to think independently and unselfishly, and to be willing to follow movements that are in the public interest, and not in the interest of merely his class.

The overthrow of boss rule needs an organization as skilfully planned and managed as that of the boss himself. The main difference between this organization and that of the boss must be its purpose to carry out the will of the citizens in the interest of the citizens, and not the will of the boss in the service of special interests.

The method most frequently advocated for the overthrow of boss rule is the establishment of the direct primaries for the nomination of candidates for office. Doubtless some of the direct primary laws would tend to contribute to that end; but neither direct primaries nor other methods can be successful unless a large percentage of the voters are so aroused to the need of unselfish, personal action that they are willing themselves to take trouble and sacrifice time—and, if necessary, money—in doing their duty as citizens.

Too frequently the assumption is made that everything connected with a strong political organization savors of boss rule and is an evil. Leadership is an essential of success in party government, however; and under a free government, owing to differences of human temperament and judgments, parties always arise. Neither strong leadership nor effective organization necessarily leads to boss rule; and yet, unless the public is unusually alert and patriotic, the tendency is in that direction; for most persons shrink from responsibility, and their bent is to follow rather than to lead.

Times of business prosperity and peace within the country and without are likely to encourage boss rule; for then most people are so eagerly looking after their private affairs that they neglect the public welfare, and are glad to have others take the trouble of managing. In times of war or of real danger to the country, the average voter becomes a patriot, alive to his country's welfare. The boss must then become a leader in the right direction or he is overthrown.

The boss can hold his position only by his ability to use the traits of human nature. Whatever the form of government or whatever the nature of human association, there will always be leadership. The only final security against the evils arising from corrupt leadership is found, therefore, in uplifting or upholding the character of the leaders, and in improving and maintaining the standard of intelligence and character of the people.

Consult Macy's *Political Parties in the United States* (1900); Woodburn's *Political Parties and Party Problems in the United States* (1903); Steffens' *Shame of the Cities* (1904); Paine's *Thomas Nast* (1904); Howe's *The City the Hope of Democracy* (1905); Alexander's *Political History of New York* (1909); Bryce's *American Commonwealth* (1910 edition); Goodnow's *Municipal Government* (1909).

Bossu, René le. See Le Bossu.

Bossuet, Jacques Bénigne (1627–1704), French preacher, historian, and controversial writer, was born in Dijon. Educated by the Jesuits of his native town, and at the Collège de Navarre in Paris, he was admitted doctor in theology in 1652, and proceeded the same year to take up the duties of a canon at Metz. Here he entered into controversy with the Protestants, and wrote his *Réfutation du Catéchisme de Paul Ferry* (a Protestant minister of the town). In 1659 he went to Paris, where he soon won reputation as a preacher, and from 1661 preached frequently at the court. Appointed bishop of Condom in 1669, he resigned the see a year later, on being made tutor to the Dauphin. For the Dauphin's instruction, he wrote, among other works, the *Discours sur l'Histoire Universelle* (1681), remarkable for its vivid generalizations and sense of historical continuity, and by some considered as the first attempt at a philosophy of history.

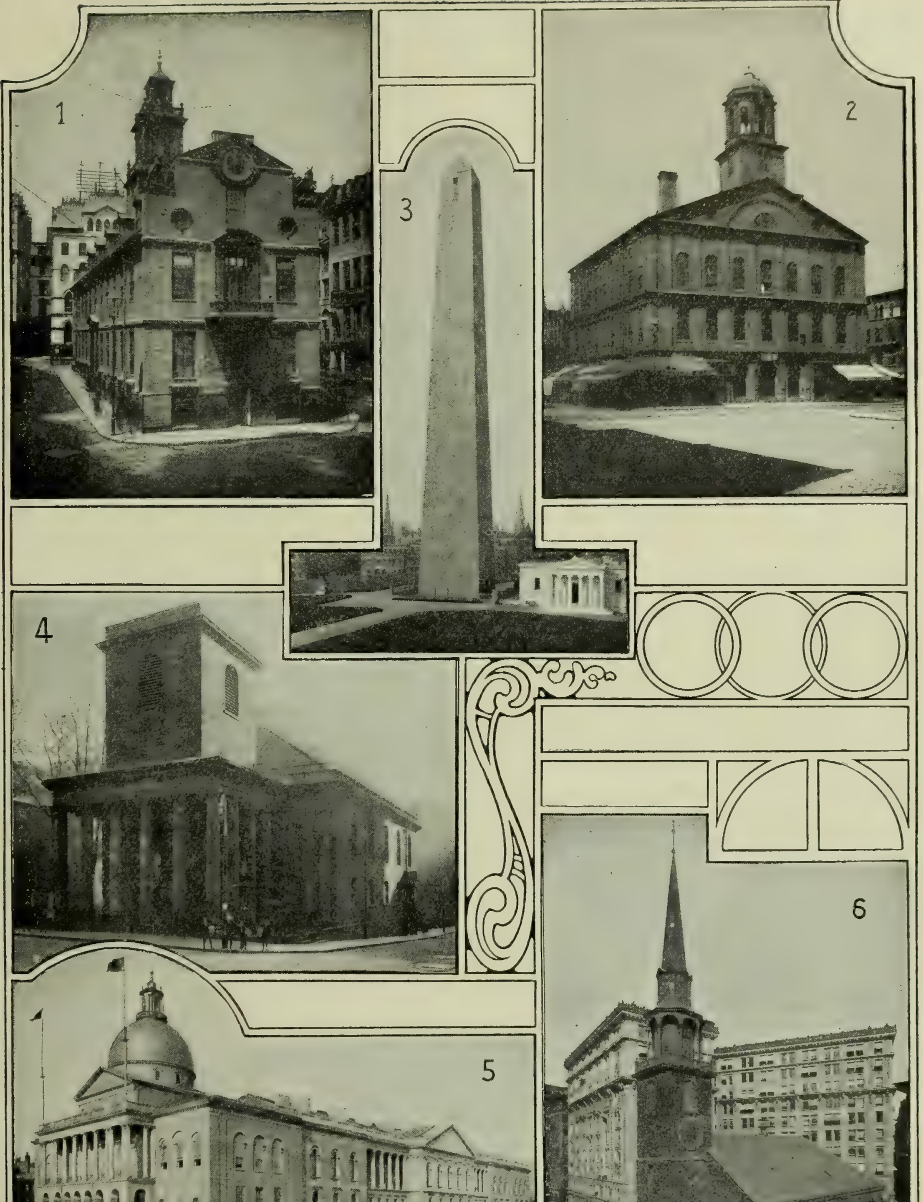
At this time the question of the rights of the Gallican Church again assumed importance, and Bossuet became its recognized champion in opposition to Fénelon and the Ultramontanes. To the assembly of the clergy in 1681 he preached the sermon *Sur l'Unité de l'Eglise*, designed to effect a reconciliation between the Pope and the king; and he inspired the *Déclaration* of 1682, which formulated the liberties of the Gallican Church. On relinquishing the tutorship of the Dauphin (1681) he was rewarded with the bishopric of Meaux. Thereafter he delivered his most celebrated funeral orations—on Marie-Thérèse (1683), Anne de Gonzague or Anne de la Palatine (1685), Le Tellier (1686), and, greatest of all, Condé (1687).

In 1688 he published *L'Histoire des Variations des Eglises Protestantes*, and in 1694 *Maximes et Réflexions sur la Comédie*, in which he attacked the theatre, and especially the plays of Molière. He again crossed swords with Fénelon on the burning topic of the Quietist heresy, which he denounced in *Instructions sur les Etats d'Oraison*(1697) and *Rélation sur le Quiétisme* (1698). From 1697 to 1701 he carried on negotiations with Leibniz to bring about a union of the Catholics and Lutherans, but without success.

A man of fervent piety and generous emotions, in theology and politics Bossuet was rigorously orthodox and conservative. In the orations the personal panegyric is always employed to illustrate a greater theme—the littleness of earthly greatness in the presence of death; but there are not wanting traits of personal emotion, and in general the style is sonorous, grave, imaginative. In the sermons, though the rhetoric is less elaborate, the poetic sensibility of the preacher finds more abundant expression; the language is pure and limpid, the argument forcible and well sustained, and many of them—as that of *Sur la Mort*—are unequalled in French oratory. The eighteenth century (*e. g.*, Voltaire) ranked Bossuet below Bourdaloue and Massillon, but modern criticism has restored him to his place as the first of French orators, and considers him one of the greatest masters of French prose.

Bossuet's Complete Works were issued in 1815–19 (Versailles Edition, 43 vols.), and in 1862–6 (Paris Edition, ed. by Lachat, 31 vols.). His *Œuvres Oratoires* were published in 1890–96, and his *Oraisons Funèbres* in 1908 (in Dent's *Les Classiques Français*). Consult Floquet's *Etudes sur la Vie de Bossuet;* Lanson's *Bossuet;* Rabelliau's *Bossuet.*

Boston, the capital and largest city of Massachusetts, one of the most historically significant and commercially important cities of the United States, and the fifth in population, is situated at the head of Massachusetts Bay, Suffolk county, in lat. 42° 21′ 27.6″ N. and long. 71° 3′ 30″ W. It is 450 miles by rail northeast of Washington, and 232 miles northeast of New York City. It comprises several former cities



VIEWS IN BOSTON

1. Old State House. 2. Faneuil Hall. 3. Bunker Hill Monument. 4. Kings Chapel. 5. State House. 6. Old South Meeting House.

and towns about Boston Harbor and along the Charles River, and includes Old Boston, or Boston proper, situated on a peninsula nearly 2 miles long and about a mile wide; East Boston, on Noddle's and Breed's Islands; South Boston, formerly Dorchester Neck, on a peninsula separated from Old Boston by an inlet called South Bay; Charlestown, on a peninsula whose water front is bounded by the Mystic and Charles Rivers and part of Boston Harbor; and the former towns of Brighton, Roxbury, West Roxbury, Dorchester, and Hyde Park (1911), which contain a number of villages. The area of the city is about 48 square miles.

Surrounding Boston, and within a radius of 12 miles, are 40 cities and towns which are closely affiliated with it. Commercially prominent among these are Lynn, Cambridge, Somerville, Chelsea, Watertown, Quincy, Everett, and Malden. The finest of the residential suburbs is Brookline.

Boston is an important railroad centre, being the terminus of several branches of the New York, New Haven, and Hartford, the Boston and Albany, and several branches of the Boston and Maine Railroads. There are two large terminal stations: the North Station, serving the railroads from northern points, and the larger South Station, serving the roads from the west and south.

The city's shipping facilities are enhanced by deep-water freight terminals and wharves, permitting rapid and convenient transfer to and from railways and ships. In 1911 the Massachusetts legislature appropriated $2,500,000 for developing the port of Boston. The first improvement was the remodelling of the Commonwealth Docks to accommodate the Hamburg-American steamship lines passenger service A further appropriation of $3,000,000 was made to build a large dry dock capable of accommodating steamers of great size, and further to develop the port according to a consistent scheme. This dry dock was completed in 1919 and was formally taken over by the U. S. Navy, Dec. 22. The city is connected by ocean steamship lines with Liverpool, London, Hamburg, Glasgow, the chief Mediterranean ports, and the West Indies. Domestic lines run to the leading ports of the New England and Southern coasts and of Nova Scotia and New Brunswick.

The climate is fairly equable; winters are cold and summers are generally hot, but tempered by the winds from the Atlantic.

The old part of the city has narrow, crooked, poorly planned and poorly graded streets, but the modern city has nearly 600 miles of paved streets and the Back Bay district is handsomely laid out. The spacious Commonwealth Avenue, 240 feet wide, with lines of trees shading the central parkway, and adorned with stately residences, is one of the finest streets in the world. Beacon Street, in the aristocratic section, also deserves special mention. These two streets, which run through the Back Bay district, rank in the fashionable world of Boston as Washington and Tremont Streets rank in the business, and State Street in the financial quarter.

Boston's street railway system is admirably organized, practically under one management, and allows liberal transfer privileges. The subway, opened in 1897 and since extended—the first public work of its kind built and owned by an American city —has greatly relieved excessive traffic pressure in the crowded business quarters. A branch extends to East Boston, by a tunnel under the Charles River, and another to South Boston. There is also an extensive system of surface and elevated electric-railways, while steam railways co-operate with the elevated, tunnel, and surface lines in increasing the facilities of transit to any part of the city and suburbs. There is a ferry service to East Boston and Chelsea.

The Metropolitan Water System is distinguished by the Wachusett Lake reservoir, on the Nashua River, the largest freshwater reservoir in the world. The basin has an area of 6½ miles, an average depth of 46 feet, and a capacity of more than 63,000,000,000 gallons. The dam is 1,250 feet long.

Parks.—The park system of Boston covers over 2,300 acres. The most noteworthy among the parks is Boston Common (48 acres), which has been dedicated to public purposes since 1634. Immediately adjacent is the fine Public Garden (24 acres), reclaimed from what was once low-lying wet land. There are numerous other parks and playgrounds in the city system, which extends in a connected series from the Common and Public Garden to City Point.

A noteworthy feature is the Boston Metropolitan Park System, including a chain of parks reaching from the Back Bay Fens up through the West Roxbury district and along Dorchester Bay to South Boston. Beautiful parkways form uniting threads; and along the Boston side of the Charles River there is an embankment laid out with boulevards and pleasure grounds. (See PUBLIC PARKS.)

The beauty of the parks, squares, and public buildings is enhanced by monuments and statues, of which the following are among the most important: Bunker Hill Monument, in Charlestown, 221 feet high, built of granite, and commemorative of the heroism of the American patriots at the Battle of Bunker Hill (q. v.); the equestrian statue of Washington in the Public Garden; the monument to Col. Robert Gould Shaw, who raised and commanded the first colored regiment of Union troops in the Civil War; the Soldiers' Monument in the Common; the Crispus Attucks monument, a memorial of the Boston Massacre (q. v.) of 1770; statues to Gen. Joseph Hooker, Edward Everett, Charles Sumner, Alexander Hamilton, Governor Winthrop, Samuel Adams, William Lloyd Garrison, Benjamin Franklin, Josiah Quincy, Beethoven, Daniel Webster, Horace Mann, Rufus Choate, Admiral Farragut, and many other notable men.

Buildings.—Boston contains an unusually large number of public buildings, many of which are of historic interest. The State House, a fine edifice with an imposing front and surmounted by a gilded dome, the County Court House, the Federal Government Building, the City Hall, and the Custom House are handsome structures in varied styles of architecture. Grouped around Copley Square are Trinity Church, one of the best examples of Romanesque architecture in the United States; the Boston Public Library (see LIBRARIES), costing $2,486,000, and containing over 1,006,000 volumes; the New Old South Church, and the Copley Plaza Hotel (1912). The Museum of Fine Arts, opened to the public in 1909, is situated on the Fenway. It is constructed of cut granite and brick, and has a frontage on Huntington Avenue of 500 feet. In 1909 a new Opera House, located on Huntington Avenue, was opened. It has a seating capacity of 2,750, and cost $1,200,000.

Other notable edifices are the Exchange Building, Tremont Temple, the Museum of Natural History, the Chamber of Commerce, the Massachusetts General Hospital, the Roman Catholic Cathedral, the Christian Science church, the Boston Athenæum (with a library of over 200,000 volumes), Symphony Hall, Horticultural Hall, the buildings of the Massachusetts Historical Society, and the new marble building of the Harvard Medical School.

In addition to the structures previously referred to, there are several which, by reason of their historical associations, are looked upon with interest as part of the city's life and reputation. Such are Faneuil Hall (see FANEUIL, PETER), originally built in 1742, under whose roof public meetings and discussions of vital moment were held previous to and during the Revolution, as well as during the Abolitionist agitation and the Civil War; the famous Old South Meeting House (1729), the historic scene of Revolutionary gatherings, the rendezvous from which the Boston Tea Party (q. v.) started on its mission, and where the annual election sermon was preached during 150 years; the old State House (1748), whose original appearance has been preserved; the Old North Church (1723); King's Chapel (1754). Of marked historic interest also are the three old burying grounds, Copp's Hill, the Central, and Old Granary.

Schools and Churches.—As an educational and literary centre Boston occupies a high position. Its public school system, which comprises kindergartens, primary, grammar, junior high and high schools, as well as trade and industrial schools, is excellent.

As a seat of learning it may justly claim the prestige of Harvard University (q. v.), and the Massachusetts Institute of Technology (q. v.), the greater part of whose schools are in the adjoining city of Cambridge and the remainder in Boston. Among other institutions of higher education are Boston University (q. v.), with its affiliated colleges, its schools of law, medicine, and theology, and its post-graduate department in philosophy, science, and language; the Medical, Dental, and Agricultural Schools of Harvard University; Boston College (Jesuit, 1860); the Medical and Dental Schools of Tufts College (q. v.); the New England Conservatory of Music (1870); the Massachusetts Normal Art School; the Lowell Institute; the High School of Commerce; and the Massachusetts College of Pharmacy. Within the city or near by are three important colleges for women—Radcliffe, Simmons, and Wellesley.

Among the many churches perhaps the most interesting architecturally are the Park Street Church (Congregational), King's Chapel (Unitarian), and the Old South (Congregational). Others of importance are the Clarendon Street Church, Ruggles Street Church, and Tremont Temple (Baptist); Arlington Street Church, New Old South, and Central Church (Congregational); Church of the Advent, Emmanuel Church, Trinity Church, and St. Paul's Cathedral (Episcopal); First Church and People's Temple (Methodist); Parker Memorial and First Church in Boston (Unitarian); First Church of Christ (Christian Science); Cathedral of the Holy Cross, Church of the Immaculate Conception and Church of the Holy Trinity (Roman Catholic).

Charitable institutions include the splendidly equipped Massachusetts General Hospital, the Homœopathic Hospital, the Children's Hospital, the Peter Bent Brigham, Robert Bent Brigham, Carney, Psychopathic, St. Elizabeth's, Baptist, and City Hospitals, the Horace Mann School for the Deaf, the Eye and Ear Infirmary, the New England Women's Hospital, and institutions for the indigent aged and for the reform of erring young persons and of criminals.

In musical art Boston ranks high, and its famous Symphony Orchestra (see BOSTON SYMPHONY ORCHESTRA) has no superior in the United States. The paintings in the Museum of Fine Arts and other public institutions are supplemented by private galleries, especially that at Fenway Court, the home of Mrs. John L. Gardner, which contains one of the best collections of art treasures in America.

Commerce and Industries.—As a commercial and financial centre Boston ranks third, after New York and Chicago. Its wool trade is second only to that of London. Its foreign commerce in merchandise is fifth among the cities of the United States, following New York, Washington, Philadelphia, and New Orleans.

In 1919 the imports were valued at $299,365,000 and the exports at $334,487,000. The exports are chiefly meat and fish products, leather, cotton and cotton waste, breadstuffs, live cattle and sheep, machinery, paper, books and printed matter, manufactures of leather, fruits, and manufactures of iron and steel, rubber, lumber, and brass. The principal imports are raw cotton and cotton waste, hides and skins, wool and camel's hair, raw fibres, fibre fabrics, chemicals and dyes, machinery, paper stock, wood pulp, fruit, etc. Vessels of 2,391,528 tons burden entered and cleared the port in 1918.

According to the United States Census of Manufactures for 1914, Boston had 3,138 industrial establishments, employing 78,894 wage earners, and a capital of $215,177,000. The cost of material used was $150,568,000, and the value of products $284,802,000, of which $134,234,000 represented the value added by manufacture.

The factory products include boots and shoes, men's clothing, confectionery, sugar, cotton manufactures, foundry and machine-shop products, women's clothing, tobacco manufactures, druggists' compounds, musical instruments, electrical machinery, and leather. Boston also occupies a prominent position as a book-publishing centre. The Boston Chamber of Commerce, with a membership of 7,500, is the largest organization of its kind in the world.

In 1920 the assessed valuation of real estate was $1,329,290,100, and of personal estate $180,509,300. The tax rate was $24.10.

Population.—The population of Boston (1920) is 748,060, which represents an increase of 77,475, or 11.6 per cent. over the 1910 census. The population at different periods has been as follows: (1790) 18,320; (1800) 24,937; (1830) 61,392; (1850) 136,881; (1860) 177,840; (1870) 250,526; (1880) 362,839; (1890) 448,477; (1900) 560,892; (1910) 670,585.

History.—Old Boston, or Boston proper, was first settled by a number of colonists who came with John Winthrop from Salem in 1630, and went to Charlestown, but who soon after moved to the peninsula which was the original site of the old city. This peninsula, named Shawmut, or Sweet Waters, by the Indians, had been occupied by Rev. William Blackstone, an Anglican clergyman; but he sold his rights to the settlers four years after they had established themselves. The place was then named Boston after Boston in Lincolnshire, England.

The civic and educational beginnings of the new Boston were soon evident in the town meeting; the free school, founded in 1635; Harvard University, founded in 1636; and in the establishment of trial by jury and the legal safeguards of life, property, and religious liberty according to the Puritan notions which had been frowned on in England, but which were the basis of the new settlement.

Fierce persecutions and vexatious religious controversies marred the early life of the town. Roger Williams (q. v.), the first advocate of religious toleration in America, left Boston, accompanied by his sympathizers; and for more than fifty years afterward, superstition and bigotry, manifested in the execution of women as witches and the persecution of Quakers, continued to exist.

In the meantime a post office, a printing house, a mint, and a bank had been established; and at the beginning of the eighteenth century, its increased growth and the founding of the first American newspaper, the Boston *News Letter* (1704), gave the town a leading position and a larger political life.

The independent spirit which rose against the impressment of seamen in 1747 and the Stamp Act (q. v.) in 1765 had already been seen in resistance to arbitrary interference by England; but it became more fixed and hostile after the Boston Massacre (q. v.), March 5, 1770, while the Boston Tea Party (q. v.) of 1773 was a decided defiance of the British government, that led to far-reaching consequences. Throughout these disturbances, 'no taxation without representation' was the guiding principle of the colonists; and this principle was held more firmly than ever when the Boston Port Bill (q. v.) of 1774 was enacted by the British Parliament as a punishment for the Tea Party. As a natural consequence, the inhabitants were among the first in active duty on the outbreak of the Revolution; and the Battle of Bunker Hill (q. v.) was fought on June 17, 1775. After a long siege the British were compelled by Washington to evacuate the town in March, 1776. (See Revolution, American.)

The embargo during Jefferson's administration retarded the shipping and commerce of Boston; but these rapidly increased after the War of 1812. Henceforth the only serious interruption to Boston's business growth was the Civil War.

Two notable events, significant of the moral force of the city, were the establishment of the *Liberator* in 1831, by William Lloyd Garrison (q. v.), and the founding of the New England Anti-Slavery Society in 1832.

A fire in the business district in November, 1872, destroyed more than $75,000,000 of property; within two years, however, this area was rebuilt, and presented a much finer appearance than before the fire.

In 1907 a commission of seven was appointed by Mayor Hibbard to devise a practical working form of government for the city. This commission drafted a new charter, by which the finance commission, of five members appointed by the governor, became a permanent body, the council was reduced to nine members, and the mayor's executive and appointive powers were largely increased. In 1909 the legislature adopted this new charter. The mayor is elected for four years but may be recalled at the end of the second year. His appointments do not require city council confirmation, but may be rejected by the State Civil Service Commission.

A series of strikes on shipbuilding and government construction work broke out in and around Boston in the fall of 1917, but they were quickly put in the hands of government officials for settlement and soon ended. An event of national importance, because of its effect on the public safety of the whole country, was the strike of the Boston police in September, 1919, which left the city unprotected and at the mercy of an army of thugs and criminals. Governor Calvin Coolidge (q. v.) took a firm stand, treated the strikers as mutinous, and quickly suppressed the strike.

Bibliography.— Consult Drake's *Old Landmarks and Historic Personages of Boston;* Hale's *Historic Boston;* Lodge's *Boston* (Historic Town Series); *Memorial History of Boston* (ed. by Winsor); Ernst's *Constitutional History of Boston;* Howe's *Boston, the Place and the People* (1907); Crawford's *Old Boston Days and Ways* (1909).

Boston, seaport, England, on the River Witham, 4 miles from the sea, and 30 miles southeast of Lincoln, on the Great Northern Railway. Its most noteworthy feature is the Church of St. Botolph (Boston-Botolph's town), one of the largest (290 × 98 feet) and finest specimens of the Decorated style, with a tower 290 feet high, forming a conspicuous landmark for mariners. There are a Grammar School (1554), a Blue-Coat School, an Athenæum, and a Guildhall. The chief industries are the manufacture of agricultural implements, sails and ropes, brewing and tanning, iron and brass founding. Coal, corn, and agricultural implements are exported. Some shipbuilding is carried on, and there are lines of steamers for Hull, London, and Hamburg. The sea approach was formerly silted up, but has been much improved by deepening and straightening the channel. The corporation dock has an area of 7 acres, and a quayage of 2,330 feet. Deep-sea fishing is carried on.

In Plantagenet times Boston was a chief port of the kingdom, and much frequented by traders of the Hanseatic League. Foxe, author of the *Book of Martyrs*, and Ingram, founder of the *Illustrated London News*, were natives of the town. Pop. (1911) of parliamentary borough, 16,673; of municipal borough, 21,910. Consult French's *Story of Old Boston.*

Boston, Thomas (1676–1732), Scottish divine, was born in Duns, Berwickshire. He was ordained to the Presbyterian ministry in 1699 and labored at Simprin (1699–1707) and Ettrick, Peeblesshire (1707–32). He became known throughout Scotland for his defence of the right of Christian people to choose their own ministers; his refusal to take the abjuration oath (see Abjuration); his opposition to Simson, divinity professor at Glasgow, on account of his doctrinal teaching; and for his share in the 'Marrow Controversy' (q. v.). His treatise on *Human Nature in Its Fourfold State* (1720) exercised a powerful influence on the religious life of Scotland. *The Crook in the Lot* was also a great favorite with the Scottish peasantry. His *Memoirs* (1776) are a valuable commentary on his time.

Boston College, a Roman Catholic educational institution in Boston, Mass., founded in 1864, and conducted by the Fathers of the Society of Jesus. It includes preparatory and collegiate departments with a college course of four years, leading to the bachelor's degree. It has about 45 founded scholarships.

Boston Massacre, a riot which occurred in Boston on March 5, 1770, the culmination of a series of disturbances due to the quartering of British soldiers in that city. A crowd of citizens, led by one Crispus Attucks, threw snowballs and other missiles at a small party of soldiers, who fired into the crowd, killing three and wounding seven, of whom two died. Eight soldiers, with Captain Preston, were placed on trial for the shooting. Preston and six of the soldiers were acquitted, while two were convicted of manslaughter and branded in the hand.

Boston Port Bill, a bill passed by the British Parliament on March 31, 1774, providing for the shutting up of the port of Boston, Mass., and the removal of the seat of government to Salem. The bill was introduced by Lord North in retaliation for the events of the Boston Tea Party (q. v.). So far from having the effect of reducing the people to submission, the bill only inflamed them to a more spirited resistance; and with the hearty assistance of the towns contiguous to Boston, it was never more than a dead letter.

Boston Symphony Orchestra, of Boston, Mass., one of the best orchestras in the United States, was founded in 1881 by Henry Lee Higginson. Its first conductor was Georg Henschel. He was succeeded, after three years, by William Gericke, of Vienna, under whom considerable advance was made, many Viennese and other foreign musicians, including Franz Kneisel as leader, being engaged. After an interval, during which Arthur Nikisch and Emil Paur were successively conductors, Gericke resumed the direction of the orchestra. The present conductor is S. Koussevitsky (1924–). The Orchestra gives twenty-four concerts annually during the winter season, besides visiting New York five times, and Baltimore and Philadelphia once a year.

Boston Tea Party, an incident occurring in the United States just previous to the American Revolution. As a practical protest against the principle of 'taxation without representation,' a party of Bostonians, disguised as Indians, boarded three ships laden with taxed tea, and threw 350 chests into Boston Harbor (Dec. 16, 1773). Governor Hutchinson had previously refused to accede to the request of the Boston town meeting that the vessels be ordered back to England without being unloaded; and the English government had refused to accept the equivalent of the tax offered by the East India Company, on condition that they should be allowed to deliver the tea in America free of duty. In retaliation the home government, by an act of Parliament, declared the port closed (see Boston Port Bill).

Boston University, a privately controlled institution of higher learning, established by members of the Methodist Episcopal Church, May 26, 1869. Through the relationship of its founders, Isaac Rich, Lee Claflin and Jacob Sleeper, to Wesleyan University, it traces its descent *via* Cokesbury College and John Wesley to ancient Oxford. It is composed of ten Departments and is controlled by a self-perpetuating Board of fifty Trustees of which the President of the University is an ex-officio member.

Within seven years after its incorporation, Boston University opened seven colleges and schools. The first, in 1871, was the School of Theology, continuing on new foundations the work of a theological seminary which had been transferred from Newbury, Vermont, to Concord, New Hampshire, in 1847, and thence to Boston in 1867. The next department, opened in 1872, was the School of Law. In succession followed, in 1872, the College of Music, the first undergraduate department; the School of Medicine, developed from the New England Female Medical College, which had been in existence since 1848; the School of Oratory in 1873, and the College of Liberal Arts in the same year; the Graduate School of Arts and Sciences in 1874. Articles of agreement were ratified in 1875 whereby the Massachusetts Agricultural College at Amherst became (and until 1911 continued) substantially an agricultural department of the University. The School of Oratory was discontinued in 1879. In 1891 the College of Music was discontinued, but was reëstablished in 1928.

More recent departments are the College of Business Administration (1913), the School of Education (1918), the School of Religious Education and Social Science (1918), and the College of Practical Arts and Letters (1919). The University Summer Session, initiated by the College of Liberal Arts, was first organized in 1915. In the several departments, the usual degrees are offered. The Graduate School offers courses leading exclusively to the degrees of A.M. and PH.D.

In addition to the above Schools and Colleges, a Summer Session of the University is maintained, and there is also an Extension Department carried on. For recent statistics see Table under the heading College.

Bostrôm, bō'strûm, Kristoffer Jakob (1797–1866), Swedish philosopher, who exercised an extraordinary influence over his pupils by the magnetism of his personality, was born in Pitea. After studying at the University of Upsala, in 1833–7, he became tutor of the royal princes; but he returned to the university, and in 1840 was made professor, a post he held for twenty-three years.

Bostwick, Arthur Elmore (1860–), American librarian and editor, was born in Litchfield, Conn. He was graduated (1881) from Yale University (PH.D., 1883), and after being assistant editor of the *Forum* (1890–92) and holding various appointments in New York libraries, in 1909 he became librarian of the St. Louis Public Library. He was president of the American Library Association in 1907–08 and of the American Library Institute, 1909–12 and 1925–27. In 1925 he made a survey of Chinese libraries at the invitation of the Chinese Association for the Advancement of Education. He was an associate editor of the *Standard Dictionary*, has been science editor of the *Literary Digest* since 1894, and has published the *Young Folks' Cyclopaedia of Games and Sports* (with John D. Champlin); *The American Public Library* (1910; 4th ed., revised, 1929); *The Different West* (1913); *Earmarks of Literature* (1914); *The Making of an American's Library* (1915); *Library Essays* (1920); *A Librarian's Open Shelf* (1920); edited 'Classics of American Librarianship' (10 vols., 1915–date) and has contributed to encyclopedias and periodicals.

Boswell, borough, Pennsylvania, in Somerset County, on the Baltimore and Ohio Railroad; 18 miles southwest of Johnstown. The leading industries are coal mining, lumber yards and textile manufactures. Pop. (1910) 1,878; (1920) 2,168.

Boswell, boz'wel, James (1740–95), the biographer of Samuel Johnson, and eldest son of Lord Auchinleck, a Scottish judge, was born in Edinburgh. He visited London for the first time in 1760. In 1762 he made his first attempt at authorship by contributing to *A Collection of Original Poems by Scotch Gentlemen.* Early in 1763, while passing through London, he was introduced to Dr. Johnson, and a warm friendship sprang up between them. In 1767 he published *Dorando*, a Spanish tale little known; and in 1768, *The Essence of the Douglas Cause*, a defence of the claim of Archibald Douglas to the dukedom of Douglas. In 1768 appeared his *Account of Corsica, with Memoirs of General Paoli;* and in the following year a volume of *British Essays in Favor of the Brave Corsicans.* In 1773 he accompanied Johnson on his journey to the Hebrides. From 1777–9 he wrote a series of papers, called 'The Hypochondriac,' in the *London Magazine.* In 1785 he published the *Journal of a Tour to the Hebrides*, and in 1786 he was called to the English bar.

In May, 1791, Boswell produced his extraordinarily successful *Life of Dr. Johnson.* But the author succumbed to hypochondria and alcoholism, to which he had given way after his wife's death in 1789, and died in London on May 19, 1795. It is generally conceded that the *Life of Johnson* stands alone in the English language for the faithful portraiture of its subject. Boswell's *Letters to the Rev. W. J. Temple* were published in 1857; and Charles Rogers edited (1874) for the Philobiblon Society a curious tract relating to Boswell, called *Boswelliana.*

Boswellia, a genus of trees of the family Burseraceæ, natives of India, Persia, and Arabia. The flowers have five petals and a crenulated granular disc. The fruit consists of a triangular capsule with three valves and three cells, each cell containing one seed. *B. serrata* is a large tree with pinnate leaves and small pink flowers in axillary racemes. Boswellia is the tree which produces the fragrant resin olibanum, believed to be the frankincense of the Bible.

Bosworth (Market Bosworth), market town, England, in Leicestershire, 13 miles west of Leicester. Here Richard III. was defeated and slain by Henry Richmond (1485). Pop. (1921) 23,202.

Bosworth, Joseph (1789–1876), Anglo-Saxon scholar, was born in Derbyshire. While vicar of Little Harwood in Buckinghamshire (1817–29) he published his *Anglo-Saxon Grammar* (1823). In 1829–40 he acted as chaplain in Holland, and in this time appeared the *Anglo-Saxon Dictionary* (1838), his principal work; *Origin of the Dutch* (1836); *Scandinavian Literature* (1839). From 1840 to 1857 he was vicar of Waithe in Lincolnshire, and later rector of Water Shelford in Buckinghamshire. In 1858 he was appointed to the Rawlinson professorship of Anglo-Saxon at Oxford, and in 1867 he gave $50,000 for a similar endowment at Cambridge.

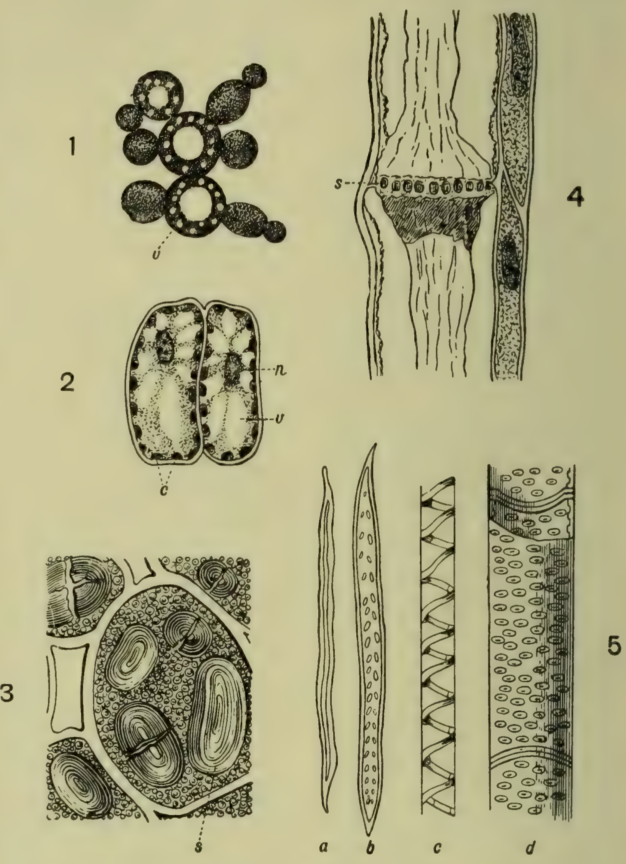
Böszörmeny, bûs′ur-mān-y′, or Hajdu-Böszörmeny, town, Hungary, in the county of Hajdu, 13 miles northwest of Debreczin. Pop. 28,000.

Bot. See Bot-fly.

Botanical Society of America, a general association of leading American botanists, organized in 1893. In 1906 it was enlarged by federation with the Society for Plant Morphology and Physiology and the American Mycological Society.

Botanic Garden, a garden in which the plants grown, and the method of their arrangement and cultivation, are intended to subserve some definite scientific purpose. The botanic gardens in connection with universities, and as independent establishments all over the world, are the direct outcome of the physic gardens in which simples were formerly cultivated. Perhaps the first record of a garden of this kind occurs early in the 14th century, as belonging to a member of the Salernitan school of medicine; and before the first half of that century had run its course, the republic of Venice had also established a similar garden. With the Renaissance and the study of what is now called natural science came the establishment in Italy (Ferrara, Padua, Pisa, Bologna, Florence, Naples) of botanic gardens in the modern sense. Germany (Nuremberg, Leipzig, Breslau, Heidelberg, Giessen, etc.) and France (Montpellier, Paris, the Jardin des Plantes) were not long in following the example thus set. In the United States, the garden at Bronx Park, in New York City, is one of the most recent as well as the most important. The Missouri Botanical Garden in St. Louis is an outgrowth of the Shaw Gardens, and in Brookline, near the city of Boston, is the Arnold Arboretum, a public park which is especially rich in trees and shrubs. The most noted gardens in Great Britain are those of Oxford (1632), Chelsea (1677), and Kew (1670). There is a famous tropical garden at Buitenzorg, Java, another at Calcutta, India, and one in Singapore, Straits Settlements. South America has one at Rio de Janeiro. At the present time nearly all great universities have at least a small botanic garden in connection with research work in botany.

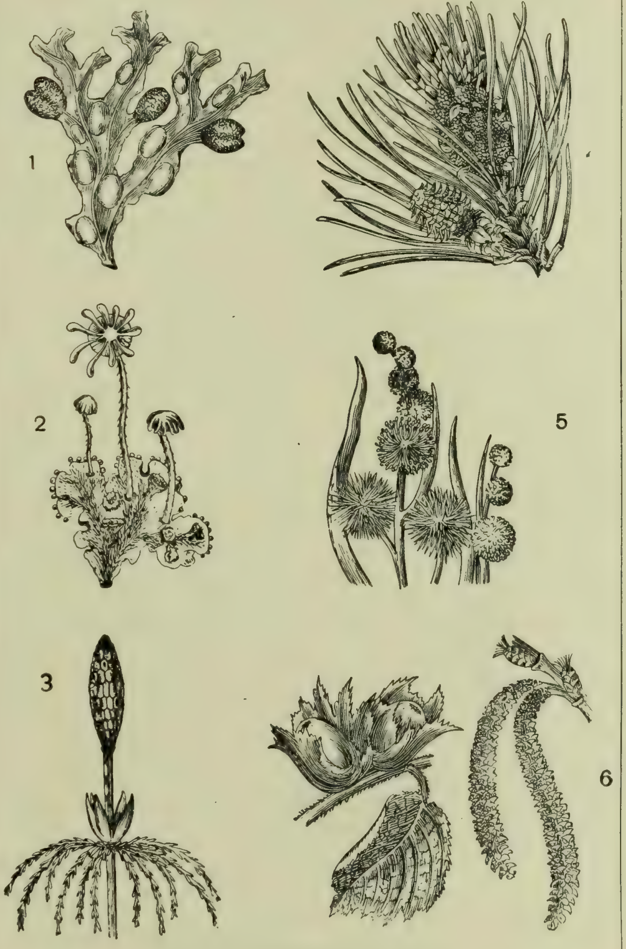
Botany, that branch of the wider science of biology which deals with plants. Since the simplest organisms consist of a single cell, it is not an easy matter to draw the line between the lowest plants and the lowest animals. To overcome this difficulty, Haeckel proposed to include both in a group which he called Protista. This, however, has not been generally accepted.



Botany: Histology

Types of plant cells: — 1. Cells of yeast, a simple fungus, showing cell spaces or vacuoles (*v*). 2. Two cells from a leaf, showing chlorophyll corpuscles (*c*), nucleus (*n*), and cell spaces (*v*). 3. Starch-containing cells from seed-leaf of pea — (*s*) starch grain. 4. Sieve-tube from vascular-bundle, showing sieve-plate (*s*) or perforated partition, at the sides are nucleated companion cells (after Strasburger). 5. Elements of wood. *a*, wood fibre; *b*, tracheid, with pitted wall; *c*, vessel with spiral thickening; *d*, vessel with pitted wall — the cross bands show the original cell walls.

History.—It was not until the first half of the 16th century that there was anything like a scientific treatment of botany, which is generally thought to have commenced with Brunfels of Strassburg (1488–1534), who described 340 species. Lobel, a Dutchman (*c.*1538–1616), physician to James I., raised the number to 2,191, which was trebled by Caspar Bauhin in the early part of the 17th century (1623). Among British botanists of the pre-Linnæan period must be mentioned Turner (d.1568); Morison (1620–83), regius professor of botany at Oxford; and John Ray (1628–1705), who introduced the word 'species' in a technical sense, and to whom we probably owe the first clear idea of a natural system. Linnæus (1707–78) is justly reckoned the father of modern botany. Not only did he systematize it; he enlarged its province by sending many of his best pupils to explore and collect in regions where no scientific work had been done.



Botany: Classification of Plants.

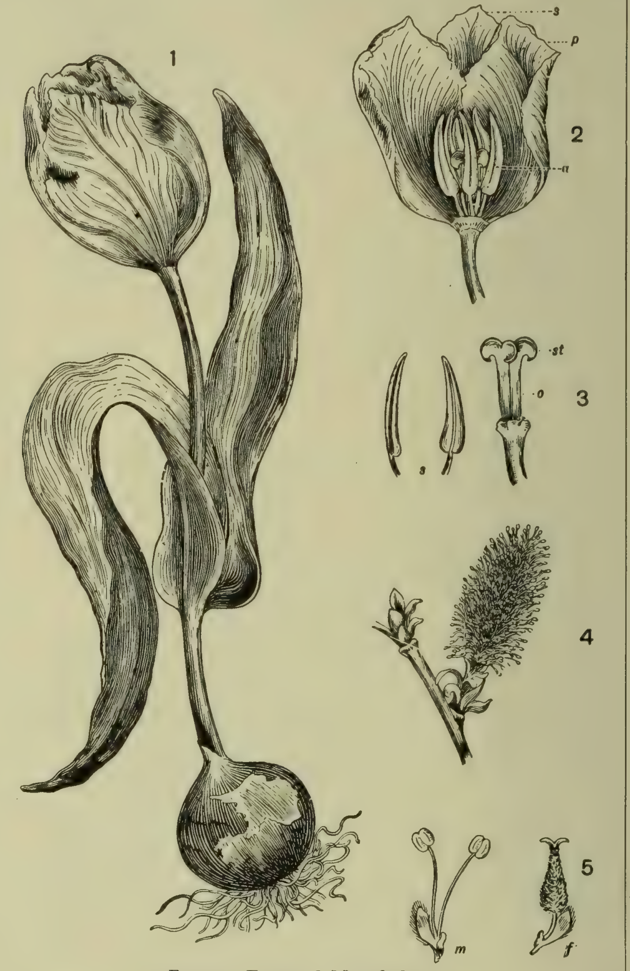
1. Thallophytes—an alga or seaweed (*Fucus*) 2. Bryophytes—a liverwort (*Marchantia*). 3. Pteridophytes—part of the fertile shoot of horsetail (*Equisetum*). 4. Gymnosperms—branch of fir (*Pinus*) with male and female cones. 5. Monocotyledons—flowers of bur reed (*Sparganium*). 6. Dicotyledons—male and female catkins and fruit of hazel (*Corylus*).

Classification.—Early systems were on broad lines, taking little note of minute differences. Thus for a long period 'herbs, shrubs, trees' were the only classes recognized. Then followed an alphabetical arrangement. Cæsalpinus, physician to Pope Clement VIII., in 1583, published a system based chiefly on the fruit; but Tournefort (1656–1708), professor of botany at the Jardin des Plantes, Paris, drew up a scheme which held its ground till the days of Linnæus. It had two main divisions—herbs and trees. Under herbs were three subdivisions—(1) with simple flowers; (2) with compound flowers; and (3) destitute of flowers, including grasses, ferns, and mosses. The trees were divided into four groups, based on the characters of the petals. The characters and arrangement of the reproductive organs (stamens and pistils) were the basis of the Linnæan system (1735). It consisted of twenty-four classes, of which the last contained the mosses, ferns, lichens, seaweeds, and fungi, while the rest comprised the flowering plants. This was avowedly provisional, and intended to pave the way for a natural system based on relationships of which the sum of the characters was to be the test. Of this only a fragment was issued in 1738. Antoine Laurent de Jussieu (1748–1836) worked on the lines of relationship; but no classification indicating real relationship was possible till it was attempted on the basis of evolution. The following gives the principal points of such a classification, omitting details on which there is much difference of opinion:—

1. Cryptogams. (1.) Thallophytes.—Single or many celled plants, the vegetative portion not being differentiated into leaves and stem. Here are grouped bacteria, diatoms, algæ, fungi, and stoneworts. (Lichens are not regarded as distinct plants, but as resulting from the union of a fungus and an alga.) (2.) Bryophytes.—The liverworts spring from a thallus, while the mosses show division into stem and leaf; but none have true roots. (3.) Pteridophytes.—These show relationship to the flowering plants in having root, stem, and leaves, and in the possession of vascular bundles.

2. Phanerogams, the true flowering plants. (1.) Gymnosperms.—The flowers always unisexual, generally naked, though in a few cases there is a small perianth consisting of scale leaves. The cycads and conifers constitute nearly the whole class. (2.) Angiosperms.—The flowers generally hermaphrodite, and provided with a perianth divisible into calyx and corolla. Here belong the grasses, herbaceous plants, and shrubs, and all foliage trees. There are two sub-classes: (*a*) Monocotyledons—seed with a single cotyledon or root leaf; stem usually simple, as in the palm; (*b*) Dicotyledons—seed with two root leaves; stem generally well branched.

Morphology.—Here we have to do with external form and internal structure. The simplest conceivable plant-form is a single spherical cell, such as may be met with in some of the fresh-water algæ, though an aggregation of such cells is more common. The next step in development is shown by the attachment of plants by a base, and the formation of a growing point, or apex, at the opposite extremity. This may be seen in sea-lettuce. In the bladderwrack, an equally common seaweed, the branching of the original apex gives rise to a number of growing points. In the mosses, with stem and leaves, there is a foreshadowing of roots in the rhizoids by which these plants attach themselves to the surfaces on which they grow. In the next higher group, the ferns and their allies, true roots are present, so that they resemble the phanerogams in this respect. A typical phanerogam consists of a root, or descending axis; a stem, or ascending axis, which may be simple or branched; and the leaves—all subserving the purpose of nutrition. Leaves vary greatly in size and shape, and all the appendages of the stem or branches may be traced to modifications of the foliage or surface leaf, which normally consists of an expanded portion called the blade, connected with the stem by a petiole or leaf-stalk, which may be protected at the base by a sheath, or by leaf-like appendages called stipules at each side. The typical flower of the angiosperms consists of four whorls of metamorphosed leaves, arranged thus from the outside: calyx, formed of sepals; corolla, formed of petals; the andrœcium, or male system, consisting of anthers containing pollen; the gynœcium, or female system, the important part of which is the ovary, containing the ovules, surmounted by a style, expanded at its apex into a stigma. The first two whorls are protective of the others, which are the reproductive organs. If both systems are present, the flower is bisexual; if either is absent, it is unisexual, and the sex is determined by the system present. If male and female flowers grow on the same plant, it is said to be monœcious; plants bearing only male or female flowers are diœcious. Of the former, the box is an example; of the latter, the common nettle. Internal morphology (often called histology or vegetable anatomy) shows how this structure is built up. In all organisms the ultimate unit is the cell. Hooke was the first to detect plant cells, and figured dead cork cells in his *Micrographia* (new ed. 1667). Their importance, however, was not recognized till Schleiden's work in 1838 showed that plants were built up of cells and modifications of cells. In its simplest form a plant cell is more or less globular. When aggregated, plant cells may be of various forms and sizes, and, in addition to the protoplasm, contain a nucleus; there may also be chlorophyll, or green coloring matter (sometimes masked by other pigments, as in red and brown seaweeds), starch grains, aleurone grains, and crystalline bodies. Aggregations of cells constitute cellular tissue, well seen in the leaves and stem of mosses. Vascular tissue, of which there are many modifications, is formed of rows of superposed cells, the walls of the adjacent cells in each row having been absorbed, thus forming tubes. Aggregations of vascular tissue (vascular or fibro-vascular bundles) are always found in the phanerogams, though they may be first clearly made out in the ferns and their allies, and there seems to be a foreshadowing of them in the mosses.



Botany: External Morphology.

1. External morphology of tulip, showing roots, modified stem or bulb, leaves, and flower. 2. Section of tulip flower; *s*, one of outer leaves or sepals; *p*, one of inner leaves or petals; *a*, anther of stamen. 3. Stamens and gynœcium of tulip; *o*, ovary; *st*, stigma—the style is here absent—s, stamens. 4. Catkin of willow, a diœcious plant. 5. Individual florets of willow: *m*, male flower, with two stamens; *f*, female flower, with ovary crowned with cleft stigma. In these flowers sepals and petals are absent.

Physiology is concerned with plants as living organisms—*i.e.* with the functions of the organs of nutrition and reproduction. In the simplest form—such as slime fungi (by some claimed as animals)—food may be taken in at any part of the body, while reproduction is effected by means of single-celled bodies called spores. This method is peculiar to the cryptogams, in some of which, however, there is alternation of generations, well seen in the ferns, where the spore gives rise to a leafy growth, on which are developed male and female systems, and from the union of the products of these systems new fern plants arise. The food of plants (with some few exceptions) is liquid and gaseous. The former is water combined with various earthy salts, and is absorbed by the roots; the latter consists of carbon dioxide, absorbed from the atmosphere by the leaves, in which it is broken up under the influence of sunlight, the carbon being retained to nourish the plant, while the oxygen is given back to the air. The crude sap (the water impregnated with salts) taken up by the roots passes through the stem to the leaves, where starch is formed and free oxygen given off. During the darkness the starch is dissolved in the cell sap, and passes downwards through the tissues of the stem. By the leaves excess of carbon is got rid of through the absorption of oxygen and the giving off of carbon dioxide in the process of respiration, and by their stomata or pores excess of moisture is exhaled in the process of transpiration. The reproduction of the higher plants is sexual. In the stamen the essential part is the anther, or little bag at the top, containing the pollen grains or male cells, while the ovules in the ovary enclose the female cells in the embryo sac. When in the process of fertilization the pollen is shed on the stigma, the grains send out tubes which carry the male cells down to the egg cells. By this process, and the consequent changes, the ovule becomes a seed, and the persistent parts of the flower a fruit.

Geographical Distribution.—With the general adoption of the theory of evolution, and the disappearance of that of special creation, the distribution of plants on the earth's surface had to be accounted for. This led to the mapping out of the globe into regions and sub-regions, characterized by a distinctive flora. About forty years ago George Bentham distinguished three distinct floral regions:—1. Northern, characterized by conifers and the catkin-bearing Amentaceæ, and its vast assemblage of harbaceous plants, and having three subdivisions—Arctic - Alpine, Intermediate or Temperate, and Mediterraneo-Caucasian. 2. Southern, broken up, so that the connection is only traceable by the possession by two or more of them of the large characteristic groups, such as the Restiaceæ, Proteaceæ, Diosmeæ, etc. The divisions are the Antarctic-Alpine, Australian, Andine, Mexico-Californian, and South African. 3. Tropical, characterized by the Anonaceæ, Restiaceæ, Proteaceæ, palms, and giant grasses, with three divisions—Indo - Malayan, American, and African. These nearly correspond to the later divisions—Boreal, Tropical, and Austral—of Oscar Drude, though he had a greater number of subdivisions or 'floral domains,' and separated the aquatic from the land flora.

Fossil Plants.—It was not till the beginning of the 19th century that anything of importance was done in the study of fossil plants and the first book published in Britain on the subject was Lindley and Hutton's *Fossil Flora of Great Britain* (1831–7). This study has confirmed the theory of evolution; for with plants, as with animals, there is an upward tendency from the lower and older to the higher and more recent rocks. In the Primary or Palæozoic rocks seaweeds occur as low as the Silurian; and in the Upper Silurian, ferns, horse-tails, and lycopods, which attained their maximum in Carboniferous times, marked also by conifers and cycads. Palms and dicotyledons appear in early Tertiary times.

See A. Kerner, *The Nat. Hist. of Plants* (Eng. trans. by F. W. Oliver; new edition, 1902); A. Gray, *Botanical Text-book* (1880); L. H. Bailey, *Lessons with Plants* (1898); Coulter, *Manual of the Botany. . .of the Rocky Mt. Region* (1886); N. L. Britton and A. Brown, *Illd. Flora of the Northern United States* (1896–98); A. W. Chapman, *Flora of the Southern United States* (1897).

Botany Bay, a suburb (5 m. s.) of Sydney, New South Wales, a picnic resort, with a magnificent beach (Lady Robinson's Beach) on the w. side of Botany Bay, a nearly land-locked inlet of the sea about 5 m. long. On the s. side of the bay is a monument commemorating the landing of Captain Cook on April 28, 1770. The place is popularly associated with the transportation of criminals, the British government having sent Commodore Phillip to found a penal settlement there in 1787. He, however, selected a more suitable site a little farther north. Pop., including Botany North (1901), 7,167.

Bot-fly, or Horse Bot-fly (*Gastrophilus equi*), an insect which lays its eggs on the hair of horses, especially the hair of the legs and breast. The animal, apparently owing to irritation set up at the spot, licks the eggs or larvæ off, and the latter thus ultimately reach the stomach. Here they attach themselves to the mucous membrane, and feed on the gastric secretions. When mature, the larvæ quit the body of the host with the fæces; and after pupation the winged adults emerge, to begin the cycle anew. The warble-flies (*Hypoderma*) of oxen and the nostril-flies (*Œstrus*) of sheep are related forms, to which the name of bot-fly is sometimes extended. The bot of sheep is related but differs in habits. See Sheep-bot.

Horse Bot-fly and Mature Larva.

Both, Jan (1610–52), Dutch painter, one of the first of his countrymen to become Italianized. He went to Rome with his brother Andreas (1609–50), who painted figures and animals into his landscapes. His subjects are the Italian lakes; his work is in the style of Claude Lorraine, wrought in warm color, with beautiful sunlight effects. Chief works: *Landscape with Muleteers*, and five others (National Gallery, London); *Artist Studying from Nature* (Amsterdam, Van der Hoop collection); *Baptism of the Eunuch* (Buckingham Palace, London); and landscapes in Dulwich, S. Kensington, and Wallace collections, London. See H. Havard's *Dutch School of Painting* (trans. by G. Powell, 1885, and Radcliffe's *Schools and Masters of Painting* (1898).

Botha, Louis (1863), commandant-general of the Boer forces in the South African War (1899–1902), and Prime Minister (the first) of the Transvaal Colony, since March, 1907, was born at Greytown hamlet, colony of Natal. As a member of the Volksraad for Vryheid, he, together with Delarey, took a liberal and temperate view in politics. When war was declared, Assistant Field-cornet Louis Botha fought as Lukas Meyer's subordinate at Dundee (October, 1899); but when his old friend retired, ill, to Pretoria, Botha was given the command of the Utrecht, Vryheid, and Wakkerstroom commandoes. On December 6, 1899, Botha was appointed commander of the Tugela positions, against General Buller, and on March 27, 1900, on the death of General Joubert, he succeeded him as commandant-general. Botha's history from the time he assumed command on the Tugela is, in fact, the history of the war from Colenso (Dec. 15, 1899) down to the signing of the terms of surrender at Vereeniging (May 31, 1902).

Bothnia. See SWEDEN. For GULF OF, see BALTIC SEA.

Bothriocephalus, a genus of tapeworms, of which *B. latus*, the broad or Russian tapeworm, occurs frequently in man. The first stage occurs in fish, especially the pike and turbot. In consequence, the parasite is particularly common in countries where much fish is eaten in an uncooked or imperfectly-cooked state. The adult tapeworm has two suckers, but no hooks, and may reach a length of eleven yards; the eggs hatch into free-swimming ciliated embryos—a very remarkable fact among tapeworms.

Bothwell, tn. and par. (13,595 ac.), N. Lanarkshire, Scotland, on r. bk. of river Clyde, 8 m. S.E. of Glasgow; sandstone quarries, coal mines, and iron mines. Part of the town is a residential quarter for Glasgow merchants. About a mile S.E. is Bothwell Brig, in the haughs at which (June 22, 1679) the Covenanters were routed by the Duke of Monmouth. (See Scott's *Old Mortality*.) Joanna Baillie, the poetess, was born here in 1762. Pop. (1911) of par. 54,891; of tn. 3,015.

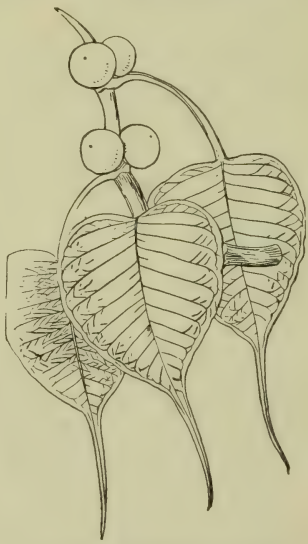
Bothwell, JAMES HEPBURN, FOURTH EARL OF (?1536–78), husband of Mary Queen of Scots. He led certain Border attacks on the English, and in October, 1559, intercepted £3,000 sent to Elizabeth for the use of the Lords of the Congregation. In 1560 the queen-dowager entrusted him with a special mission to France. After her death he was, in January, 1564, sent a prisoner to England, whence he was permitted to go to the Continent. Recalled by the queen in 1565 to assist her in subduing Moray's rebellion, he, after the murder of Rizzio in March, 1566, gradually acquired a supreme influence in her counsels; and there can be no doubt that his determination to secure her hand was the chief cause (though there were others) of Darnley's murder. At the same time, both he and the queen were the dupes of cooler and cleverer intriguers, and his marriage rendered the ruin of both inevitable. At Carberry Hill (June 15, 1567) the queen, to save Bothwell's life, made arrangements by which he should be permitted to escape. After lurking for some time in the north of Scotland, he made an attempt to establish himself in the Orkneys as a kind of pirate; but on being pursued by Kirkaldy of Grange, he escaped to Denmark, arriving at Copenhagen on September 30, 1567. At first he met with a favorable reception, but was never at liberty. In June, 1573, he was removed from the castle of Malmö to close imprisonment at Drangholm, in Zealand, where he died (April 14, 1578).

Botocudos, a primitive Brazilian people who are at present confined to the Aymores coast range between the Rio Doce and Ilheos, but who formerly occupied a great part of the eastern seaboard, and spread inland as far as the Tocantins basin. Owing to their savage customs, cannibalism, and intractable disposition, they were treated as wild beasts by the early European settlers, and their numbers were thus reduced from perhaps 60,000 or 70,000 to less than 15,000 in 1900. They call themselves *Nac-nanuk*, sons of the soil,' and undoubtedly represent the aboriginal element in E. Brazil, being distinguished by round, flat features, rather oblique eyes, small nose, and a general Mongolic expression, heightened by a dirty yellowish complexion. See Deniker's *Races of Man* (1901).

Botone, or BOTONNY, in heraldry, said of a cross the ends of whose arms are shaped like trefoils or buds.

Botoshani, tn., Roumania, on Roman-Czernowitz Ry., divided into an inner, badly-built town, and handsome suburbs full of boyar palaces. Pop. (1899) 32,193, sixty-three per cent. of whom are Jews.

Bo-Tree, also called PIPAL or PEEPUL, the *Ficus religiosa*, or sacred fig-tree of India, held in veneration by the sect of Vishnu (who is said to have been born under its leaves), and also by the Buddhists. It is a tree of considerable size, with sap abounding in caoutchouc, while it also yields lac, the lac insect making its abode in the branches.



Leaves and Fruit of Bo-Tree.

A sacred bo-tree exists at Anuradhapura, in Ceylon, said to have been planted in B.C. 245, as a sprig of the tree at Gaya. Under this latter, Prince Siddhartha sat when he became a Buddha. Its history, in detail, has been faithfully kept in the native chronicles for centuries, so that it is perhaps the oldest tree in existence of which an authenticated history can be given.

Botrychium. See MOONWORT FERN.

Botta, CARLO GIUSEPPE GUGLIELMO (1766–1837), Italian historian, born in Piedmont; favored the French revolutionary party, and, after suffering imprisonment for his views (1792–4), entered the French service as military surgeon. He became a member of the French legislative body (1804), and was appointed rector of the academies of Nancy and Rouen (1817–22). In 1809 Botta published at Paris his *Storia della Guerra dell' Independenza d'America*, thought by some to be the best history of the Revolutionary War that has been written outside the United States. More important is the *Storia d'Italia dal* 1789 *al* 1814 (Paris, 1824; Eng. version, Lond., 1826), which narrates events of which the author had largely been an eyewitness. He shows himself a partisan throughout; but the work is written with an enthusiasm and in a style which secured it a great popular success, and the prize of the Accademia della Crusca. A third essay, the *Storia d'Italia continuata da quella del Guicciardini dal* 1534 *al* 1789 (1832), is a comparative failure. See *Lives* by Dionisotti (1875) and S. Botta (1877); also Pavesio, *C. B. e le sue Opere Storiche* (1874).

Botta, PAUL EMILE (1802–70), archæologist, son of the preceding, born at Turin. He became successively French consul at Alexandria, Mosul, Jerusalem, and Tripoli. In 1843 he began a series of archæological investigations among the Babylonian ruins, and conveyed to Paris a large number of fragments of monuments, which now form an Assyrian museum. His chief works are *Mémoires de l'Ecriture Cunéiforme Assyrienne* (1848), *Monument de Ninive* (1847–50), and *Lettres sur ses Découvertes à Khorsabad* (1845).

Botta, VINCENZO (1818–94), Italian-American educator, was born at Cavaller Maggiore, Piedmont, Italy, and was educated at the University of Turin, in which he became professor of philosophy. He prepared reports on the German educational system for the

Sardinian government, and came to the U. S. for the purpose of studying its public-school system in 1853. He soon made up his mind to remain, was naturalized, and was appointed professor of the Italian language and literature at the University of New York, a position which he held until a few years before his death. He married (1855) Anne Charlotte Lynch, the poet, and their literary receptions were frequented by people of note in letters and art for more than thirty years. Professor Botta published works on Dante and Cavour.

Bottesini, Giovanni (1823–89), famous player on the double-bass, was born at Crema in Lombardy, and died at Parma. After studying at Milan, he made tours over Europe and America, often visited Great Britain (first in 1849), and everywhere created an immense sensation. He lived in Havana, Cuba, from 1846 to 1849, and during that time visited the U. S. on several occasions, appearing at one of these visits with the violinist Arditi and meeting with great success throughout his tour. He was also a director—*e.g.* at Paris (1855–7), Palermo (1861–2), Barcelona, London (1871), Cairo. In 1887 his oratorio, *The Garden of Olivet*, was produced at the Norwich musical festival. He also composed operas, and wrote a work on his instrument.

Botticelli, Alessandro ('Sandro') di Mariano Filipeppi (1447–1510), Florentine painter, took his name from the goldsmith to whom he was apprenticed. For painting he was placed under the best master of the day, Fra Lippo Lippi, and later studied with Pollaiuolo and Leonardo. Botticelli was a man of marked originality and poetical imagination, and by nature a mystic and symbolist. His work is marked by brilliance of color, admirable lineal decoration, and exquisite delicacy in the execution of flowers, foliage, stone-work, jewels, etc. There is charm in his figures —in the melancholy of the face, in the floating, curving draperies. The known details of his life are few. His finest work was done under the patronage of the Medici. He owed the inspiration of his mythological and classical subjects to the poet Poliziano, and to Leon Battista. In 1478, upon the murder of Giuliano de'Medici, he painted the portraits of the murderers on the walls of the Bargello; and in 1480 he commemorated Lorenzo's victory over the Pazzi faction by painting the fine *Pallas and the Centaur* now in the Pitti Palace. In the *Adoration of the Magi* (Florence Academy) all the members of the Medici family are represented as participating in the scene. In 1481 he was called to Rome, and there painted in the Sistine Chapel three frescoes, containing admirable groups of energetic, vital figures. His chief paintings comprise *Venus Rising from the Sea* (Uffizi, Florence); *Spring, or Venus and the Graces* (Florence Academy); the exquisite circular panel of *Madonna and Child* (Uffizi); *Annunciation* (Uffizi); *Venus and Mars* (National Gallery, London); *Calumny* (Uffizi). In 1500 he painted the symbolical *Nativity* (National Gallery, London). In his later years he devoted himself to engraving. Among these engravings are the designs (Berlin) of the *Inferno* for Landino's edition of Dante (1481). There are about 250 engravings, dating to the end of the 15th century; the subjects are religious and mythological. Of these, Botticelli is usually credited with the design, and Baccio Bandini with the execution. See Supino, *Sandro Botticelli* (1900); Plunkett, *Sandro Botticelli* (1900); Steinman, *Botticelli* (Eng. trans. 1901); Berenson, *Florentine Painters of the Renaissance* (1898); Cole, *Italian Masters* (1892); Cartwright, *The Painters of Florence* (1901); and Crowe and Cavalcaselle, *History of Painting in Italy* (1864).

Botticher, Karl Heinrich von (1833–1907). German statesman; was born in Stettin; entered the Prussian civil service in 1855; became governor of Schleswig in 1876 and president of the province of Schleswig-Holstein in 1879. He was appointed imperial secretary of state for the interior in 1880 and also vice-president of the Prussian ministry in 1888; resigned in 1897; was president of Saxony in 1897–1906.

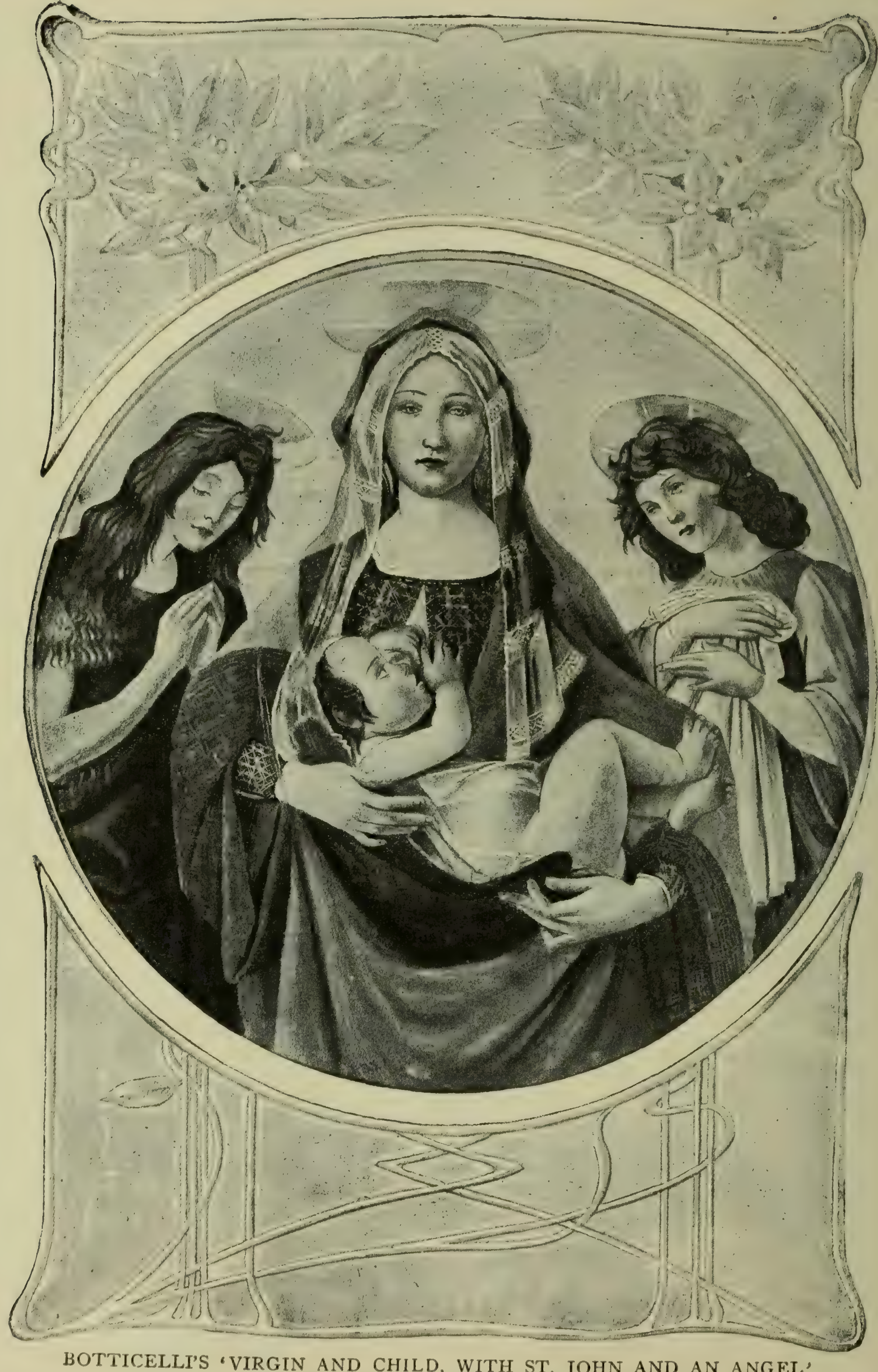
Böttiger, Carl Vilhelm (1807–78), Swedish author; professor of æsthetics (1856) and modern literature (1858) at the University of Upsala; early published several volumes of poetry remarkable for great beauty of style, and a mild elegiac tenderness not without a touch of morbid sentimentality —*e. g. Nyare sanger* (1833) and *Lyriska Stycken* (1837–9).

Bottini, Enrico (1837–1903), Italian surgeon, was born at Stradella, prov. Pavia. In 1865 he became lecturer in obstetrics and surgery at Novara. In 1866 he anticipated Lord Lister by publishing a work on the use of carbolic acid in surgical operations; and he was one of the first to recognize the part played by parasitic organisms in the etiology of morbid conditions. In 1877 he was appointed professor of surgery at Pavia, a chair occupied by Scarpa and Porta. Here he distinguished himself by remarkable advances in operative surgery. In 1887, on the death of Depretis, he resigned his chair on his election as member of Parliament for Stradella, which he afterward represented in the Chamber of Deputies. He returned for a time to his professorship, but died in retirement at San Remo.

Bottle, a vessel with a narrow mouth for holding liquids. The first bottles were probably made of the skins of animals, principally goats. Not only are skin bottles represented on the monuments of Egypt, but Herodotus describes how those Egyptian bottles were made—by sewing up the skin and making one of the legs to serve as a neck. Repeated reference is made in Scripture to the skin bottles of the ancient Hebrews, and vessels of this nature were also used by the Greeks and Romans. Skin bottles are still employed in S. Europe, W. and Central Asia, and Africa for holding wine or water. But the ancient Egyptians had bottles and vases of various other materials, such as stone, alabaster, porcelain, ivory, gold, silver, bronze, and glass, some of them of beautiful design. The Phœnicians and Romans also made bottles of glass. Earthenware bottles were possessed by the Egyptians and Hebrews, and are still used in the East. Venice held the monopoly of the manufacture of glass bottles during the middle ages. In China, beautiful bottles of various forms and substances, such as jade, agate, and rock-crystal, have long been known.

Bottles made of the dried rind of gourds are used by the Italian peasantry. In the middle ages leather bottles were in common use in Europe, and the sign 'The Leather Bottle' is still used for inns. Modern bottles are mostly made of glass, though earthenware or stoneware bottles for special purposes are extensively manufactured. Some years ago the manufacture of unbreakable paper bottles was attempted. A long slip of paper is made into a tube by being wound round a revolving mould; the bottom and neck are afterward added. The outside is glazed, and the inside coated with an acid-resisting medium.

Bottle-making is the simplest branch of glass-working. The operator gathers sufficient molten glass on the end of his blowpipe, partially inflates it by the breath, and drops it into a brass or iron mould, in which it is blown into its permanent form. The jagged mouth is moulded in the working furnace or 'glory-hole,' and the bottle is placed in the 'leer' or annealing tunnel, where it is tempered. The moulds, which are either in two pieces, hinged at the base, or in three pieces, one for the body and two for the neck, are kept at a red heat dur-



BOTTICELLI'S 'VIRGIN AND CHILD, WITH ST. JOHN AND AN ANGEL' (NATIONAL GALLERY, LONDON).

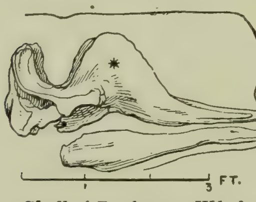
ing use. The blowing is now done, especially in the case of wide-mouthed bottles and jars, by machinery.

Bottle Chart. See OCEANOGRAPHY.

Bottle Gourd, or CALABASH, a plant of the genus Lagenaria and order Cucurbitaceæ. The common bottle gourd is a native of India, and is cultivated in other warm climates. It is a creeping plant with white flowers, and its bottle-shaped fruit, with a hard rind, used for holding water, is termed a calabash. This fruit, which may be also club- or urn-shaped, is eaten when immature, or even when fully ripe.

Bottle Gourd, and Section.

Bottle-head or **Bottle-nose,** a small whale (*Hyperoödon rostratus*), the bottle-nose whale, or blackfish, which reaches a length of about 30 ft., and inhabits the N. Atlantic Ocean. It resembles the sperm whale in structure and habits, and has an oil cavity in the top of the head, from the contents of which spermaceti is made; the blubber also yields a valuable sperm oil. The food consists chiefly of cuttles.



Skull of Bottle-nose Whale.
* Centre of Spermaceti Cavity.

Bottle-Tree. An Australian tree (*Sterculia rupestris*), noted for the bottle-like shape of its swollen trunk, the limbs springing from its brim, as it were. The wood is soft, and is said to be tapped by travellers, to obtain water stored in the globular expansion.

Bottling Machine, a machine constructed for filling bottles. Many machines have been patented for the purpose, suitable for bottles provided with corks and those with various forms of patent stoppers. Previous to bottling, care must be taken to see that the bottles are thoroughly clean, by leaving them in hot water containing soda, and washing them afterward in cold water, while similar care must be taken with the corks. In the case of fine wines this is a matter of the greatest importance. The bottling machine for ordinary liquor is of a simple character, the commonest consisting of a small trough connected with a barrel, the contents of which flow through siphon tubes or by means of air or gas pressure. The aërated-water machine is more complicated as provision is made for the bottle being raised into position and filled, while means have to be taken to prevent the escape of gas, and to close tightly the bottle.

Bottomry. In maritime law, a conditional obligation in which the ship or its cargo or both are pledged as security for a loan. When the cargo alone is pledged the obligation is known as a *respondentia*. The condition of a bottomry agreement is that the ship shall reach its destination and the obligation is void if the ship becomes a loss. A bottomry contract must be in writing, and it is usually in the form of a bond, known as a bottomry bond. A captain or master has an implied authority to borrow money on bottomry but only for the purpose of completing the voyage, and if all other means of raising money fail. Bottomry takes priority over a mortgage, or a subsequent purchase without notice, but not over claims for wages, salvage, pilotage, etc. When several bottomry bonds are given by a master or owner for the purpose of saving the 'bottom,' or ship, the later rank for payment before the earlier, the latest ranking first.

Bottrop, comm., dist. Münster, prov. Westphalia, Prussia, 9 m. N.E. of Duisburg, with coal mines. Pop. (1900) 24,847.

Botzaris. See BOZZARIS.

Botzen. See BOZEN.

Boucher, FRANÇOIS (1703–70), French painter and decorator of the Louis XV. period. He was the pupil of Le Moine, and was to some extent influenced by Watteau. His imagination was extremely fertile, his hand facile, and his brilliant, daring, superficial work appeals frankly to the eye and to the senses. A hard worker, he lived also a life of pleasure, and gradually the precision of his early work gave way to the perfunctory and unpleasing pictures of his decay. His decorations for the boudoir of Mme. de Pompadour, his friend and patroness (some of his most charming work), were bought by the Marquis of Hertford. He painted several portraits of his patroness, one of which is in Edinburgh, another in South Kensington; and also painted pastoral and religious subjects, designed tapestry, and executed scene-paintings. He was professor of painting in Paris (1744), member of the Academy of Painting (1734), and was appointed (1765) painter to the king. After France, the Wallace Collection, London, possesses the greatest number of his pictures. See Lady Dilke's *French Painters of the Eighteenth Century* (1899).

Boucher Crevecœur de Perthes, JACQUES (1788–1868), French author and archæologist, who advocated extreme views of the antiquity of man, basing his arguments on the human remains found in the Moulin-Quignon quarry near Abbeville. His chief works are *De la Création* (1839–41) and *Antiquités Celtiques et Antédiluviennes* (1846–65). See *Life* in French, by Ledieu (1885).

Bouches-du-Rhone, dep. of S. France, on the Mediterranean, E. of the Rhone. It contains large tracts of uninhabitable land, such as the Camargue, or alluvial and malarial delta of the Rhone; the Crau, on the l. bk. of the E. branch of the Rhone, considered as an ancient stony delta of the Durance; and the Etang de Berre. The coastline is 80 m. in length. The east is hilly, being traversed by three ranges more or less parallel to the coast. The climate is hot and dry, with occasional strong north winds (*mistral*). The chief product is fruit, as the olive, fig, almond, and mulberry. The only minerals are lignite and bauxite. There is some marble and slate. Industry and commerce are mainly concentrated in Marseilles, the capital. Area, 2,026 sq. m. Pop. (1901) 734,347.

Boucicault, DION (Dionysius Bourcicault) (1822–1890), Irish dramatist and actor, was born in Dublin, Ireland, and received his education partly at Tottenham, and partly at London University under his guardian, Dr. Dionysius Gardner. His first play, *London Assurance*, was produced at Covent Garden Theatre in 1841, and won him instant recognition. From that time until his first appearance as an actor, 1852, he produced fourteen plays by himself or in collaboration with Benjamin Webster; among them, *The Irish Heiress* and *Old Heads and Young Hearts*. His own first appearance was at the Princess's Theatre in his adaptation of *The Vampire*, which was followed at the same theatre by clever adaptations of *The Corsican Brothers* and other standard plays. In 1853 he married Miss Agnes Robertson, who acted with him during his first visit to America, 1853–60, where he repeated his English successes. Boucicault made another signal triumph, on his return to England, with *The Colleen Bawn*, a sensational drama—the first of its kind—following in some degree the plot of Gerald Griffin's *The Collegians*. It was succeeded by *The Octoroons* (1861), *Arrah-na-Pogue* (1865), *Led Astray* (1874), and *The Shaughran*, particularly an American favorite (1875). Boucicault visited America twice more, remaining there after 1876, and dying in New York. The plays mentioned form but a small portion of his dramatic works, which were usually adaptations of some book or play already in existence, but illumined and transformed by his native wit into something new and strange. As an actor Boucicault was not exceeded in light touches of humor and pathos by any performer of his time.

Boudinot, Elias (1740–1821), American statesman and philanthropist, was born in Philadelphia, Pa., studied law under Richard Stockton, and practised in N. J. He was president of the Continental Congress, 1782–4, and was a member of the House of Representatives from N. J., 1789–95. Mr. Boudinot was director of the U. S. mint from 1795 to 1805, when he retired to Burlington, N. J., and devoted himself to philanthropic and religious pursuits, being a founder and first president of the American Bible Society. One of his books, *A Star in the West* (1816), is an effort to identify the North American Indians with the lost tribes of Israel.

Boufarik, or Bouffarik, tn., Algeria, 23 m. s. of Algiers by rail, now one of the healthiest spots in Algeria. Important market. Pop. (1901) 9,284.

Boufflers, Stanislas, Marquis de (1738–1815), French poet, born at Nancy. He became a marshal (1784), governor of Senegal (1785), and member of the French Academy (1788). At the Revolution he retired to Berlin, returning to Paris in 1800. His *Œuvres Complètes* were published in several editions (*e.g.* in 4 vols. 1817). They include *Voyage en Suisse* (1770), a good collection of letters; *Aline* (1761), a story; and *Poésies et Pièces Fugitives* (1782). An edition of his *Poésies Diverses* was published by Uzanne in 1886.

Bougainville, island of the Solomon group, Pacific Ocean, discovered by Bougainville in 1768; is separated from Choiseul I. by Bougainville Strait. It is 150 m. long by 30 m. wide; alt. 10,000 ft.

Bougainville, Louis Antoine de (1729–1811), French admiral, served in Montcalm's campaign in Canada (1756–9), and again in Germany during the Seven Years' War. After a futile attempt to colonize the Falkland Is., he commanded the first French expedition round the world (1766–9), which led to many important geographical discoveries. Bougainville acted as a naval commander in the American Revolutionary War, and took part in several naval battles between the French and British, and in 1780 became a field-marshal. Napoleon made him senator and count. See his *Voyage autour du Monde* (1771–2; new ed. 1889); Pascal's *Essai sur la Vie et les Ouvrages de Bougainville* (1831); and Parkman's *Montcalm and Wolfe* (1884).

Bougainvillea, in botany, a genus of the order Nyctaginaceæ, a native of S. America. The flowers are almost hidden by large red or purple membranous bracts, which form magnificent masses of inflorescence. *B. glabra* is grown extensively as a creeper in greenhouses.

Bough, Samuel (1822–78), British landscape painter, was entirely self-taught, and spent much of his early life wandering about the country sketching. His occupation as scene painter in Manchester (1845), and later in Glasgow and Edinburgh, influenced strongly his later landscape work. About 1849 he was induced by Macnee to devote himself to landscape, and in 1857 became A.R.S.A., and R.S.A. in 1875. The best of Sam Bough's work is in water-color, and is marked by boldness of execution and command of atmospheric effects. See his works in Edinburgh National and Glasgow Art Galleries; also Mrs. Tytler's *Modern Painters* (1873).

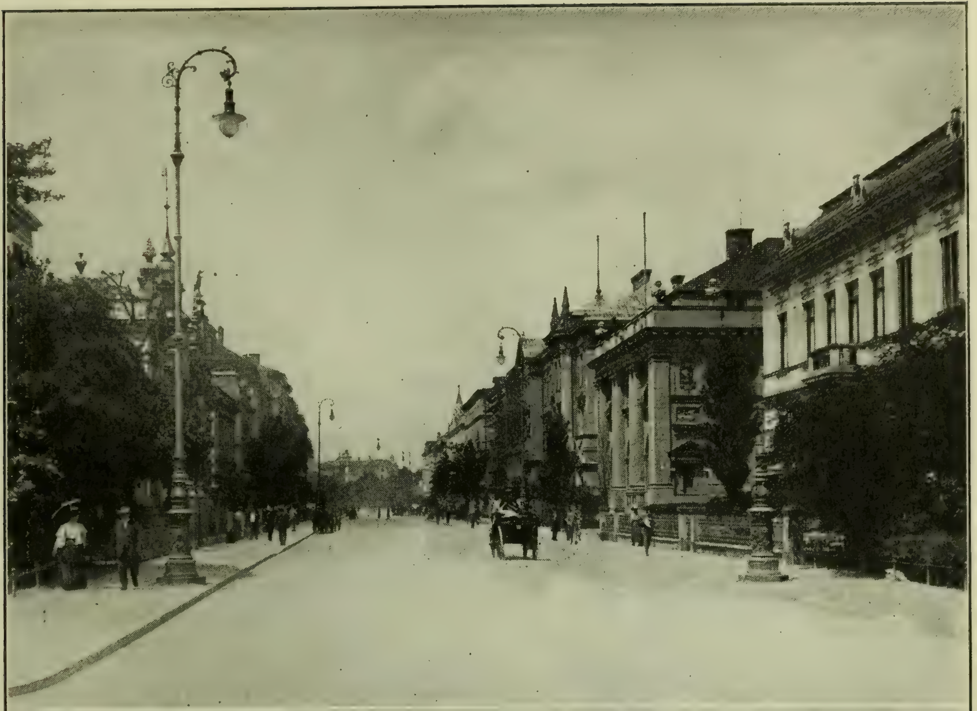
Bought and Sold Note. A memorandum of sale of chattels made and delivered to the buyer and seller respectively by the broker by whom the sale was effected. The notes describe the subject matter and terms of sale in identical form, and the parties accepting them without protest are bound by the terms expressed in them. Though employed also in brokerage sales in the United States, bought and sold notes play a much less important rôle here than they do in similar transactions in England.

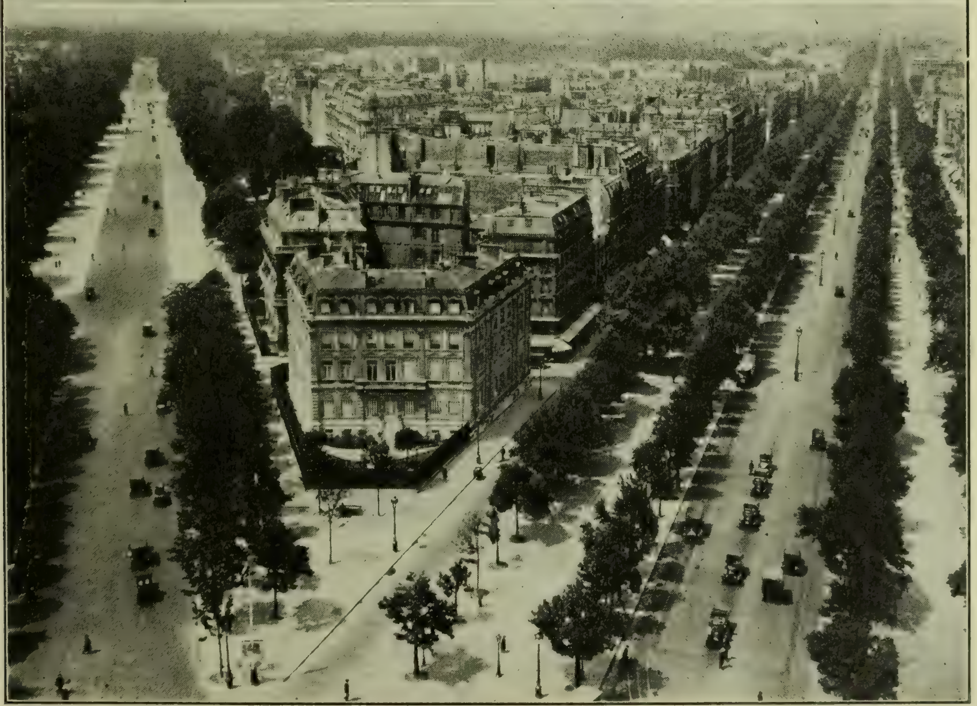
Boughton, George Henry (1836–1905), one of the most graceful and refined of modern English painters, was born near Norwich, but was brought by his parents to the United States, where they settled near Albany. He took up the study of art at an early age, and without a master, but later went abroad to study and settled in London in 1862. He was a constant exhibitor at the Royal Academy, to which he was elected associate in 1879, and member in 1896. In 1871 he was made a member of the National Academy of Design, New York. In 1886 he published, in conjunction with E. A. Abbey, a volume of *Sketching Rambles in Holland*. *Weeding the Pavement* is in the Tate Gallery, London. Boughton's subjects were taken from the Puritan days in New England, the 'Knickerbocker' life of New York, and modern English scenes, and his work is highly esteemed in the U. S. as well as in Great Britain. Among his popular pictures is the *Return of the Mayflower*. His *Edict of William the Testy* is in the Corcoran Art Gallery at Washington. See Muther's *Hist. of Modern Painting* (1895–6), and Sheldon's *Hours with Art and Artists* (1882).

Bougie (Fr. 'candle'), a solid cylindrical instrument passed by surgeons into the membranous passages of the body—*e.g.* the gullet or urethra. Bougies are made in various sizes and materials. The term is also applied to rods of substances which melt at the body temperature, and are introduced into the body passages as a vehicle for various drugs incorporated with them.

Bougie (anc. *Saldæ;* Arab. *Bejaia*), fort. seapt., Algeria, on bay of the same name, beautifully situated on the slope of Mt. Guraya (2,300 ft.), 120 m. by rail E. of Algiers. In the 5th century it was made by Genseric the capital of the Vandal kingdom in Africa. In 708 it was conquered by the Arabs; and in the 10th century a Berber tribe, the Bejaia, took possession of the town, gave it their name, and raised it to such importance that it was called 'Little Mecca.' It had then a population of 100,000, and was the entrepôt between N. Africa and Europe. In 1152 it became subject to Morocco, and in 1555 to the pashas of Algeria, and under their rule it sank lower and lower, until, when the French occupied it in 1833, it was merely a ruinous village. The French have transformed it into a strongly fortified place, which is rapidly growing through commerce. Pop. (1872) 7,200; (1901) 14,552.

Bouguer, Pierre (1698–1758), French mathematician, born at Le Croisic in Brittany. With La Condamine, Jussieu, and Godin, he was engaged (1735–42) in measuring a degree of meridian among the Cordilleras of S. America, and put together the





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FAMOUS BOULEVARDS

1. The Briennerstrasse, Munich. 2. The Avenue du Bois de Boulogne (left) and The Avenue de la Grande Armée, Paris

results of his discoveries in *Théorie de la figure de la terre* (1749). Among other things, he investigated the height of the snow-line, the inclination of the orbits of planets, the expansion and contraction of metals, the deviation of the plummet, density of the atmosphere, and refraction. His experiments in measuring the intensity of light are contained in *Traité d'optique* (1760).

Bouguereau, bōō-g'rō', Adolphe William (1825–1905), French painter, was a pupil of Picot, and studied in Rome (1850–5). His first Salon picture was *Egalité* (before the Angel of Death), in 1849, and he afterward contributed regularly to the old Salon. He also painted many portraits, and executed decorative work in the churches of St. Clotilde and St. Augustin in Paris. His pictures are mythological, semi-religious, and fanciful in subject. Chief among them are the celebrated *Vierge consolatrice, La jeunesse et l'amour* (1877), *Le triomphe du martyre* (1855), in the Luxembourg. Ghent, Marseilles, Dijon, and Bordeaux museums have examples of his work; but the greater number are in private hands, many in the United States.

Bouille, bōō-yā', François Claude Amour, Marquis de (1739–1800), French general, was born in Cluzet, Auvergne, of a noble French family. He entered the army, served in Germany, and in 1761 became governor of Guadeloupe. In 1778 he defended the French Antilles, and captured several islands from the British. As commander-in-chief of the army of the Meuse, the Saar, and the Moselle, he repressed the insurrection of the garrisons of Metz and Nancy (1790), and the following year attempted to rescue Louis xvi. during the flight to Varennes. Having been exiled, he entered the Swedish army, and later served under Condé. Finally in 1794 he settled in England, and died in London. He published, in English, *Memoirs Relating to the French Revolution* (1797).

Bouilly, bōō-yē', Jean Nicolas (1763–1842), French dramatist and author, was born near Tours. He held various public appointments during the Revolution. The sentimental vein in his works procured him the surname of the *poète lacrymal.* Two of his comic operas have music by Grétry (*Pierre le Grand*) and Cherubini (*Les deux journées*) respectively; others are *L'abbé de l'epée* (1795), *Fanchon* (1803), *Mme. de Sévigné* (1805). He also wrote *Contes à ma fille* (1809) and *Conseils à ma fille* (1811).

Boulainvilliers, bōō-lañ-vē-yā', Henri, Count de (1658–1722), French historian, was born in Normandy. He served for some time in the army but later devoted himself to study. His works include *Histoire des Arabes* (2 vols. 1731), and an incomplete *Vie de Mahomet.* His contributions to old French history, published in 1727, 1733, and 1753, are characterized by an immoderate admiration of feudalism and similar institutions.

Boulanger, bōō-läñ-zhā', George Ernest Jean Marie (1837–91), French general and agitator, was born in Rennes. He was educated at St. Cyr and saw service in Algeria, Italy, and Cochin-China, and was at Metz with Bazaine in 1870; but escaped capture by the Germans, and shared in the defence of Paris. In 1876 he went to the United States as head of the commission to the Centennial celebration, and again in 1881 headed a French deputation at the celebration of the centenary of the battle of Yorktown. He was appointed brigadier general in 1880, and commanded the army of occupation in Tunis in 1884–5. In January, 1886, he was appointed minister of war in the Freycinet cabinet, when the various manifestations of his strongly democratic spirit soon made him the idol of the populace—'*Le brav' général.*' In May, 1887, however, he was removed from the office of war minister, and shortly afterward placed under arrest for attacking his successor, and in March, 1888, was deprived of his command and placed on the retired list. In July, 1888, he fought a duel with the prime minister, M. Floquet, whom he had insulted. Boulanger, now the idol of the Parisian populace, was returned for the city by a crushing majority, being also favored by the royalists; but on April 2, 1889, he caused considerable excitement by suddenly disappearing from Paris, to escape an impending prosecution for conspiracy by the French government. At the elections in September Boulangism suffered a signal defeat, though Boulanger himself was returned for the Montmartre division of Paris. His election, however, was declared invalid, and his opponent was awarded the seat. On Sept. 30, 1891, he committed suicide in a cemetery near Brussels.

Boulay de la Meurthe, bōō-lā' d'lä mûrt', Antoine Jacques Claude Joseph, Comte (1761–1840), French statesman, was born in Chaumouzey in the Vosges. He was minister of state during the Hundred Days and in 1813 Napoleon made him Count, but he was banished from 1815 to 1819. He published *Bourrienne et ses erreurs* (2 vols. 1830), and two works on the English revolutions.

Boulder, bōl'der, city, Colorado, county seat of Boulder County, on Boulder Creek, at the eastern base of the Rocky Mountains, and on the Union Pacific and the Colorado and Southern Railroads; 30 miles northwest of Denver. It is the seat of Colorado State University and of the Colorado Chautauqua Institute. The city has a public library and a sanatorium, and on account of the climate and the mineral springs is in high repute as a health resort. Not far from the city is the noted Boulder Cañon. There are valuable mines and oil wells in the vicinity. Pop. (1910) 9,539; (1920) 11,837.

Boulder Clay, or Till, a tough, unstratified clay, full of boulders, formed by glacial action. Great deposits occur in Northern Europe and America which were overrun by the continental ice sheets during the Pleistocene period. The boulders vary in size, and are, in the main, striated and rounded, the scratches being parallel to their longer axis. The outcrops of the various rocks represented often lie great distances from the clay deposit. Layers of sand and irregular patches of gravel may be mixed with the clay; the latter is fine-grained and impermeable to water, and varies in color with the rocks from which it has been derived, but is mostly dark gray, weathering to brown. The boulder clay is, as a rule, unfossiliferous, but contains occasional layers of peat, and other deposits which have been formed during a recession of the ice-sheets and are known as interglacial beds. The surface of the clay is rarely level, usually showing rude, rounded hummocks, which are known as drumlins, often with shallow, marshy pools between them. See Glacial Period.

Boulevard, bōōl'*e*-värd (Fr.; Ger. *bollwerk*, and Eng. 'bulwark'), a word originally denoting the outer fortifications or ramparts of a town. It was later applied to a broad avenue on the site of the demolished fortifications, planted with rows of trees, and now designates broad thoroughfares generally well paved and lined with trees, irrespective of their origin. The boulevards of Paris are its finest streets.

Boulger, bōl'jer, Demetrius Charles de Kavanagh (1853–), British author and editor. In 1885 he assisted Sir Lepel Griffin in the founding of the *Asiatic Quarterly Review* which he edited for almost five years. He has published several important works on Eastern subjects and on questions of French and Belgian frontiers. His works include *Life of Yakoob Beg, of Kashgar* (1878); *England and Russia in Central Asia* (1879); *History of China* (3 vols. 1881–4); *Lord William Bentinck* (1891); *Life of Gordon* (1896); *The Congo State* (1898); *India in the 19th Century* (1901); *History of Belgium* (1902); *Belgian Life in Town and Country* (1902); *Life of Sir Halliday Macartney* (1909); *Battle of the Boyne and the Irish Brigade in the Service of France* (1911); *Belgium of the Belgians* (1911); *Holland of the Dutch* (1913); *Reign of Leopold II.* (1924).

Boulimia, bo͞o-lim′i-*a*, or BULIMIA, an excess of appetite, often arising from an irritated stomach, or in the course of certain nervous disorders. The word is also used to describe the extraordinary but physiologically natural appetite which follows on recovery from wasting disease.

Boulle, bool, the name of a famous French family of cabinet makers, whose most distinguished member was ANDRE CHARLES (1642–1732), who enjoyed the patronage of Louis XIV. He made many beautiful articles of furniture for the royal family, numerous specimens of which are preserved in the Louvre, Paris, and in Versailles and Fontainebleau. His name is given to the marquetry which he brought to a high state of perfection. Four sons followed their father's trade and their work is often difficult to distinguish from his own.

Boulogne-sur-Mer, bo͞o-lō′-ny'-sür-mâr′, important seaport, France, in the department of Pas-de-Calais, on the English Channel, at the mouth of the Liane; 157 miles northwest of Paris, and connected with Folkestone by a daily cross-Channel service. It consists of two parts, the Haute-Ville, a square surrounded by ramparts built in the 13th century which occupies the hill-top on the right bank of the river, and the Basse-Ville, lying between the old town and the river. The quarter on the left bank is known as Faubourg Capecure. The beach and the casino are on the right bank. In the Haute-Ville are the Palais de Justice, the beautiful Cathedral of Notre Dame, and the Château, now used as barracks. Basse-Ville contains most of the shops and hotels. The harbor ranks first in France for herring and cod fishing. The imports consist mainly of textiles, coal, and wood; the exports comprise eggs and fowls, dried fish, watches, tools, textiles, leather, and wine. There are steel and iron works, sawmills, dyeworks, soap and pen factories, and cement works. Sainte-Beuve (1804–69) and Mariette (1821–81) were born here.

Boulogne, the *Gesoriacum* of the Romans, was in the hands of the English from 1544 to 1550. Here in 1802 Napoleon mustered an army for the purpose of invading Britain. Pop. (1921) 55,336.

Boulogne-sur-Seine, sān′, a suburb of Paris, France, between the fortifications on the right bank of the Seine, and the Bois de Boulogne, the pleasure ground of the Parisians. It has laundries and chemical works. Pop. (1921) 68,008.

Boulton, bōl′tun, MATTHEW (1728–1809), English engineer and inventor, was born in Birmingham. In 1762 he founded the Soho metal-stamping works and seven years later became the partner of James Watt, inventor of the steam-engine, to whom Boulton's financial assistance and practical ingenuity were invaluable. He also designed (1788) machinery adopted by the Mint, and was interested in the reform of coinage; in 1797 he contracted for a new copper issue for Great Britain.

Boundary, the legal extent of a parcel of land as laid out and defined in the description thereof or as marked by known and ascertained monuments. In modern conveyances, especially in the United States, the land conveyed is generally described with great fulness and exactness, often with reference to a map or plan or to an official survey. But in many cases the boundaries are in doubt owing to a conflict between the amount of land specified and the survey, or between the courses and distances set forth in the deed and the monuments actually set up to mark off extent of the land, or to the fact that a boundary described is not a line but something having breadth, as a watercourse, a highway, or a hedge. These conflicts are determined in accordance with settled rules of law. In general, monuments govern courses and distances; *i.e.* the location of a tree or stake or other object mentioned in the deed or recognized by the parties thereto as marking the boundary at the point where it stands, determines the boundary at that point whether it coincides with the survey described in the deed or not. When a boundary is described as running from one point to another, it is presumed to be a straight line between them. When property is bounded by a road or a river, the middle line of the road or river is presumed to be the boundary. A hedge or a tree on the boundary line is the joint property of the adjoining owners. Strips of waste land beside a highway are presumed to belong to the adjoining owners. Trees which overhang a boundary line belong to the owner of the land on which the trunk stands, but the limbs that overhang may be lopped by the adjoining owner back to the line.

In Scots law, a *bounding charter* is a conveyance in which the boundaries of the land conveyed are set out in any way by which they can be definitely ascertained.

Bound Bailiff, a bailiff or sheriff's officer, who is bound by an obligation with sureties to perform the duties of his office properly. It was formerly the duty of such bailiffs to arrest insolvent debtors and convey them to prison, and, as the release of such a prisoner resulted legally in the discharge of the indebtedness for which he had been arrested, only bailiffs who had given proper security could safely be employed in that service. Hence the term bound bailiff, in its corrupted form of 'bum' bailiff, appears frequently in the literature of the 18th century in England in connection with the woes of insolvent debtors.

Bound Brook, borough, New Jersey, in Somerset County, on the Raritan River, the Delaware and Raritan Canal, and on the Central of New Jersey, the Baltimore and Ohio, the Lehigh Valley and the Reading Company Railways; 7 miles northwest of New Brunswick. The chief manufactures are engines, automobiles, incubators, lumber, woollen goods, paint, chemicals and roofing. It was the site of Washington's winter quarters for two years during the Revolution. Pop. (1910) 3,970; (1920) 5,906.

Bounding Charter. See BOUNDARY.

Bounty, a name given to a grant from the public treasury in aid of some industry the development of which is regarded as of peculiar public importance. During the 17th and 18th centuries, owing to the extraordinary importance assigned to exportation, all the chief countries of Europe granted bounties upon the export of certain commodities, especially manufactures. The most important of these bounties was the English bounty of 5s. per quarter upon the export of corn, when the domestic price fell below 48s. This bounty, introduced in 1689, continued in force for about a century. Bounties were frequently granted in aid of shipbuilding, since the development of this industry was essential to naval power. For a like reason, liberal bounties in aid of the deep-sea fisheries were granted, as the fisheries were regarded as a nursery for seamen. Bounties were also commonly granted by European nations to their colonies, to encourage the production of raw materials of which the mother country stood in need. Thus England granted bounties on shipping supplies, indigo, and several other products of the American colonies upon exportation to England.

During the 19th century the principal industries which received aid through bounties were the beet sugar industry and shipbuilding. In the countries of continental Europe excise taxes upon sugar have always been an important source of revenue. When sugar was exported, these taxes, as a rule, were refunded. Where the tax was levied upon the estimated product of a factory, or upon the estimated sugar content of the raw material, the drawback upon exportation often exceeded the tax actually paid, and thus amounted to a concealed bounty. Thus, from September 1, 1869, to July 31, 1886, Germany levied an excise tax of 17 cents per hundred pounds on all sugar beets produced, and paid a drawback of 2 cents a pound on sugar exported.

In France, Austria, and Russia the sugar industry was largely built up by export bounties, direct or concealed. Since the Brussels Sugar Convention in 1903 no bounties, direct or concealed, have been paid by the important exporting nations. (See Brussels Sugar Convention. For bounties in aid of shipping, see Shipping Subsidies.)

In the United States bounties in aid of industry have found only limited application, owing to the constitutional provision that taxes shall be levied only for public purposes. Grants by States and cities in aid of private enterprises have frequently been made, but in every case which has come directly before the courts they have been declared unconstitutional, on the ground mentioned. With the exception of a bounty upon the export of the products of the cod-fisheries, granted in 1866 and defended as a drawback on the salt duties, no direct money grant in aid of industry was made by Congress until 1890, when, upon the repeal of duties on imported sugar, a bounty was granted to domestic producers, amounting to two cents a pound on all domestic sugars made from maple sap, beet root, sorghum or cane, testing 90 degrees by the polariscope; and one and three-fourths cents on sugars testing from 80 to 90 degrees. Under this act the sugar production of the country rapidly increased, and in 1894 over $12,000,000 was paid in sugar bounties. After the repeal of the Act in 1894, in the case of the Nules Plant and Manufacturing Company *v.* John G. Carlisle and Joseph S. Miller, the Court of Appeals of the District of Columbia held that the bounty provisions of the law of 1890 were unconstitutional.

The name is also applied to a premium, in addition to the customary remuneration, granted to persons upon the performance of important public services, as upon enlistment in the army or navy in time of war. During the Civil War many of the Northern States offered bounties, sometimes amounting to over $500, to persons who should volunteer to serve in the Union army. The practice gave rise to gross frauds, many men, 'bounty jumpers,' entering the army in order to secure the bounty, and then deserting. Bounties are awarded by the United States to the officers and crews of a war-ship which destroys an enemy's war-vessel. If the enemy's ship is superior in force to the American ship which destroys it, the bounty awarded is $200 per man; if of inferior force, the bounty is $100. If the ship is not destroyed in action, but after its capture, the bounty paid is $50 per man.

Bounty, Mutiny of the. On Dec. 23, 1787, H.M.S. *Bounty*, with Lieut. William Bligh in command, left Spithead for the South Seas. The ship arrived at Tahiti in October, 1788, and started on her return in April, 1789. Because of alleged tyranny and injustice, Bligh and 18 loyal men were seized and turned adrift in the launch. They ultimately reached Timor, making a voyage of 3,618 miles without the loss of a life by sickness. The mutineers returned with the *Bounty* to Tahiti, and most of them settled there; but a few who feared capture sailed (1790) to Pitcairn Island. Of this party, after eighteen years, but one Englishman, John Adams, survived. He had organized a prosperous and peaceful miniature colony. Of the mutineers who stayed at Tahiti, twelve were captured by the *Pandora*, Captain Valentine Edwards, and three were hanged. The fate of the party which had colonized Pitcairn Island remained unknown till 1808, when the island was visited by an American vessel, the *Topaz*. John Adams, who was never proceeded against, died in 1829. Consult Barrow's *Mutiny of the Bounty*.

Bounty, Queen Anne's. See Queen Anne's Bounty.

Bouquet, bo͞o-kā', the characteristic flavor and aroma of a wine, due partly to the presence of volatile organic ethers, such as acetic, propylic, butylic, and amylic, and partly to the ferments (yeasts) used in fermenting the must.

Bouquet, Henry (1719–66), a Swiss soldier in the British service in America, was born in Rolle, Switzerland. After being in turn in the Sardinian and the Dutch service, in 1754 he entered the British army, as lieutenant colonel, becoming one of the officers of the Royal American Regiment in 1758, and in the same year was second in command, under Gen. John Forbes, of the expedition against Fort Duquesne. During Pontiac's War, as colonel, he led a force of about 500 men against the Indians in Western Pennsylvania, defeated them in the battle of Bushy Run (Aug. 5 and 6, 1763), and occupied Fort Pitt (the former Fort Duquesne), thereby winning the formal thanks of King George III., and the following year led an expedition from Fort Pitt into the Muskingum Valley, the heart of the Indian country, and brought the enemy to terms. Early in 1765 he became a brigadier general, and until his death was in command of the Southern Department of America, his headquarters being at Pensacola.

Bourbaki, bo͞or-bä'kē, Charles Denis Sauter (1816–97), French general, was born in Pau. He served in Algeria, and distinguished himself in the Crimea (1854) and in Italy, especially at Solferino (1859). On the outbreak of the Franco-German War he was in command of the Guards, and fought in the battles round Metz (1870). Although captured with that fortress, he was allowed to go, or escaped, to England on a mission to the Empress Eugénie. Then he took command of the Army of the Loire, but was driven into Switzerland by Manteuffel (January, 1871). He retired from the army in 1881.

Bourbon, Isle. See Réunion.

Bourbon, bo͞or'bun, Charles Duc du Bourbon (1490–1527), French general known as 'Constable de Bourbon, who assumed the title of the Duc de Bourbon on his marriage in 1505 to Suzanne, daughter and heiress of Pierre, Duke of Beaujeu, the last male representative of the elder line of the Bourbons. His royal blood, great military talents, and his personal bravery, especially at Agnadello and Marignano in 1515, induced Francis I. of France to make him constable of the kingdom, the highest military officer in France, when only in his twenty-sixth year. Becoming embroiled in a lawsuit with the Duchess of Angoulême, mother of Francis I., he formed a conspiracy against the latter, and upon its detection fled to Italy and in 1523 entered the service of Charles V. He distinguished himself at Sesia (1524), and at the battle of Pavia (1525), in which Francis I. was taken prisoner. Being unable to pay his troops, he attacked Rome with the object of plunder on May 6, 1527, and, being the first to mount the walls, was killed by a random shot, which Benvenuto Cellini asserts was fired by himself; but Cellini was given to boasting. The constable was buried at Gaeta. See Depeyre, *Les Ducs de Bourbon* (1897), and Robertson's *History of the Reign of Charles V.* (1864–67).

Bourbon Family, the name of a dynasty which reigned over France from 1589 to 1792, and from 1815 to 1848. The name was derived from the castle of Bourbon, in the old province of Bourbonnais. The founder of the family was Robert (d. 1317), Count de Clermont, son of King Louis IX. His son Louis (1279–1341) was the first Duke of Bourbon, and fought against the English for Charles de Bel. Pierre (1310–56), the second duke, a son of Louis I., was killed at the battle of Poitiers. His son Louis (1337–1410), third duke, was one of the most powerful vassals of the crown of France, and made large additions to the duchy by his marriage. When Charles V. concluded a peace with England, the duke was appointed guardian to the young Duke of Orleans. He was succeeded by his son Jean I. (1381–1434), who was taken prisoner by the English at the battle of Agincourt, and detained till his death in London. His son, Charles I. (1401–56), defended Orleans against the English. His son, Jean II. (1426–88), distinguished himself in the wars against the English, joined the Duc de Bretagne in the league against Louis XI., and in 1483 became constable of France. The seventh duke was Charles (1437–88), Cardinal de Bourbon, brother of Jean II. He was a diplomatist, and a favorite counsellor of Louis XI. The last and greatest of the eldest branch of the Bourbons was Charles, 'the Constable.' (See above.)

Among the collateral branches of the Bourbon family were those of Vendôme, Condé, Montpensier, Orleans, Conti, and Soissons. Antoine de Bourbon (1518–62), Duc de Vendôme, became king of Navarre by marriage (1548) with Jeanne d'Albret. His son, Henry of Navarre, was the first French king of the house of Bourbon, as Henri IV. His two sons were Louis XIII. and Gaston, Duc d'Orléans; one of his daughters, Elizabeth, married Philip IV. of Spain, and the other, Henrietta, became the queen of Charles I. of England. Louis XIII. left two sons—Louis XIV. and Philip, Duc d'Orléans, who was the ancestor of King Louis Philippe. The eldest son of Louis XIV. died in 1711, leaving three sons, the eldest of whom died in the following year—his eldest son, Louis, succeeding (as Louis XV.) his great-grandfather, Louis XIV., in 1715. His eldest son also died before his father, and his three sons reigned in succession as Louis XVI., Louis XVIII., and Charles X. Louis XVII., the only surviving son of Louis XVI., died (1795) in prison in the Temple, the second grandson of Louis XV. succeeding as Louis XVIII.; upon whose decease (1824), without issue, the third grandson, Charles, succeeded as Charles X., but was forced to abdicate in consequence of the revolution (July, 1830). Charles X.'s grandson, Henri, Count de Chambord, was styled by the Legitimists Henri V.

The younger branch of the Bourbons is the house of Orleans, whose descent starts from Philip of Orleans, brother of Louis XIV. His son Philip was great-grandfather of Louis Philippe, known to the revolutionists as 'Citoyen Egalité;' and his son Louis Philippe became king of the French in 1830, and was dethroned in 1848. On his death, his sons, the Duc d'Orléans the Duc de Nemours, the Prince de Joinville, the Duc d'Aumale, and the Duc de Montpensier, became the representatives of the house of Bourbon. The first named had two sons, known as the Comte de Paris and the Duc de Chartres. The present head of the house of Orleans, and probably the chief claimant to the throne of France, is Prince Louis Philippe Robert, born 1869. See ORLEANS, HOUSE OF.

Philip, Duke of Anjou, the second of the three sons of the Dauphin (eldest son of Louis XIV.) and brother of Louis, Duke of Burgundy (father of Louis XV.), became (1700) Philip V. of Spain, under the will of Charles II. The reign of the family was cut short by the dethronement of Queen Isabella in 1868; but in 1875 the dynasty was restored in the accession of Alfonso XII., whose son, Alfonso XIII., is now the Spanish sovereign. Philip was also ancestor of the Bourbon dynasties of Naples and Parma, both of which are extinct. The last king of Naples was Francis II., who had to flee (1860) before the troops of Garibaldi; while Parma was incorporated with the kingdom of Italy in 1859. The last of its dukes were Charles III., who was assassinated in 1854, and his son, Robert I. See Achaintre, *Histoire Chronologique et Généalogique de la Maison Royale de Bourbon* (1825); Dussieux, *Généalogie de la Maison de Bourbon* (2nd ed. 1872); Bingham, *Marriages of the Bourbons* (1889); Depeyre, *Les Ducs de Bourbon* (1897); and Coxe, *Memoirs of the Kings of Spain of the House of Bourbon* (1813).

Bourbonne-les-Bains, health resort and dist. tn., dep. Haute-Marne, France, 30 m. s.w. of Chaumont; has hot mineral springs (122°–138° F.) known from Roman times. Pop. (1901) 4,038.

Bourboule, La, health resort, dep. of Puy-de-Dôme, France, on upper reach of the Dordogne (alt. 2,790 ft.), 34 m. s.w. of Clermont, with hot-water spring (81°–129° F.). Pop. (1901) 1,947.

Bourchier, ARTHUR (1864), British actor. In 1899 he joined Mrs. Langtry's company at Wolverhampton, as Jacques in *As You Like It*, and afterward played the same part at the St. James's Theatre, London. He also toured with Miss Fortescue; then played with Sir Charles Wyndham (Charles Courtly in *London Assurance*, and Joseph Surface), with Daly's company (when he appeared in the U. S.), with John Hare in *Money*, and in 1894 took the leading part in *The Derby Winner* at Drury Lane. In the same year he married Miss Violet Vanbrugh, and, with her, took important parts under Mr. Hare's management; and in the autumn of 1895 himself undertook managerial responsibilities at the Royalty, producing *The Chili Widow* and *The Queen's Proctor*. Having toured (1896) Great Britain and the U. S., Bourchier opened the Camberwell with *A Marriage of Convenience*, and played in 22*a Curzon Street*. In 1903 he played in *The Bishop's Move*, *The Whitewashing of Julia*, and *The Golden Silence*, at the Garrick, in London.

Died
Sept 14
1927

Bourdaloue, LOUIS (1632–1704), French pulpit orator, member of the Society of Jesus (1648), was successively professor of humanity, rhetoric, and philosophic and moral theology at the Jesuit College of Bourges, his native town. From 1659–69 he preached in the provinces. In 1669 he came to Paris, where he obtained a very high reputation. After the revocation of the Edict of Nantes he went (1686) to Languedoc, to convert the Protestants, and on his return became for a time confessor to Madame de Maintenon. His later years were devoted to visiting the sick and the poor. His simple, earnest, and fearless character gave him a great influence over all classes. As a preacher he excelled in the orderly treatment of his theme, in logic, and in acute psychological analysis. His scientific and didactic methods made him the least ornate of orators, but his intense earnestness heightened his eloquence. Though not rising to the sublimity of Bossuet, he was, as Voltaire called him, 'the first model of good preachers in Europe.' *Works*, P. Bretonneau (16 vols. 1707–37), Lefêvre (3 vols. 1833–4); *Life*, by Lauras, in French (1881), and by Castets (1901).

Bourdon de l'Oise, FRANÇOIS LOUIS (*c.* 1750–97), a French revolutionist; born near Compiègne. He assisted in storming the Bastille (1792), and in forming plans for the execution of the king and the Girondists. But he joined the enemies of Robespierre on the 9th Thermidor, and was one of the party chiefly responsible for his downfall. Elected to the Council of Five Hundred, he afterward opposed the republicans, and for his royalist tendencies was transported (1797) by the Directory to Cayenne, where he died. See Thiers's *Hist. de la Révolution Française* (new ed. 1882).

Bourg-en-Bresse, cap. of dep. Ain, France, 35 m. by rail N.E. of Lyons; an important railway junction; contains the church of Notre Dame de Brou (1511–36), with fine tombs of Philibert, Duke of Savoy, his mother Margaret of Bourbon, and his wife Margaret of Austria. It is known to the English-reading world from Matthew Arnold's poem (*cf.* Edgar Quinet, *Œuvres Complètes*, vol. vii., ed. 1857–79). The town has monuments to General Joubert, Bichat, and Quinet. Bourg has manufactures of jewellery, copper ware, pottery, clogs, candles, etc.; a considerable trade is done in corn, cattle, horses, and the 'volaille de Bresse.' Pop. (1901) 18,887.

Bourgeois. See TYPE.

Bourgeois, LÉON VICTOR AUGUSTE (1851), French statesman; born in Paris; became minister of public instruction (Freycinet cabinet) 1890–2. He was minister of justice in 1893, and in 1895 formed a cabinet, in which he was minister of the interior, and later of foreign affairs. In 1898 he was minister of public instruction, and did much for the organization of schools. In 1902 he was elected president of the Chamber of Deputies and in 1905 to the Senate. In March, 1906, he became minister of foreign affairs in the Sarrien cabinet. He was a delegate to The Hague peace congresses of 1899 and 1907. In 1902 he was made a member of the permanent court of arbitration at The Hague. He has written several works on political subjects.

Died
Sept. 29,
1925.

Bourgeoisie (literally, the class of 'burgesses' or citizens of towns) is a French expression, generally used contemptuously by the aristocratic, labor, proletariat, socialist, and 'intellectual' classes for what they conceive to be a mean, philistine, and selfish breed of capitalists, shopkeepers, and professional men, whose only ideals are a certain sordid comfort, petty ostentation, and a grotesque respectability.

Bourges, tn., formerly cap. of prov. Berry, now of dep. Cher, France, 144 m. by rail S. of Paris, on a plateau not far from the geometrical centre of France. It is the seat of an archbishop, the headquarters of the 8th Army Corps, and has a large arsenal. Among the objects of historical interest are remains of a Roman wall, the cathedral of St. Etienne (one of the finest churches of France, dating from 1182), the churches of Notre Dame, St. Pierre, and St. Bonnet. The town has flour mills and breweries; manufactures cloth, leather, knives, rope, and bricks; and a considerable trade is carried on in corn, wine, wool, and hemp. Cæsar destroyed it (52 B.C.), but Augustus made it the capital of Aquitania. It is notable for the mediæval struggle between the Duke of Berry and the archbishop. Owing to its central position it has often been chosen as a meeting-place of councils, seventeen in all, of which the most important was held in 1438; it asserted the independence of the Gallican Church by an instrument known as the 'Pragmatic Sanction.' Louis XI. (1423) and the preacher Bourdaloue (1632) were born here. Pop. (1901) 46,551.

Bourget, LAC DU, the largest lake in France, dep. Savoie, at an altitude of 758 ft. above sea-level, 11 m. long by 2 m. broad, with a depth of 476 ft. It is connected with the Rhone by the Canal de Savières (2½ m. long). On the shore of the lake stands the abbey of Hautecombe (1125; restored 1824), which contains the family tombs of the princes of Savoy. To the E. of the lake is Aix-les-Bains.

Bourget, PAUL CHARLES JOSEPH (born at Amiens, 1852), member of the French Academy (1894), and one of the most successful of modern French novelists and critics. He became, in 1873, a contributor to the *Revue des Deux Mondes*, the *Renaissance*, the *Parliament*, and the *Nouvelle Revue*. His first separate publications were in poetry—*La Vie Inquiète* (1875), *Edel* (1888), *Les Aveux* (1882). In 1885 he issued a novel, *Cruelle Enigme*, which at once made his reputation. Since then he has published a great number of novels, and with these has alternated studies in criticism, written in the urbane but not very vigorous style which marks most of the French writers who have formed their prose on that of Renan. Several of these were collected in the volume styled *Essais de Psychologie contemporaine* (1884), in which he gave appreciations of Renan, Baudelaire, Flaubert, and Taine; a second series (Dumas fils, Lecomte de Lisle, the Goncourts, Tourgéniev, Amiel) appeared in 1885. Of late years M. Bourget has published some volumes of travel, of which his *Outre-Mer* (*Voyages en Amérique*), in 1895, is the best known. Probably his best novel is *Le Disciple* (1889), which contains the elements of fine tragedy. Of late, since *Cosmopolis* was published (1892), M. Bourget has seemed to take special pleasure in depicting the mixed society of all nations to be met with in Rome or on the Riviera. Publications (in addition to those already named): *Etudes et Portraits* (1888), which contains his reminiscences of a visit to England and Ireland; *Sensations d'Italie* (1891); *Psychologie de l'Amour moderne* (1891). Novels, etc.: *Un Crime d'Amour* (1886); *L'Irréparable* (1888); *André Cornélis* and *Pastels* (1889); *Notre Cœur*, *Un Cœur de Femme*, and *Nouveaux Pastels* (1890); *La Terre Promise* (1892); *Un Scruple* (1893); *Un Saint* (1894); *Une Idylle Tragique* (1896); *Recommencements* (1897); *Complications Sentimentales*, *La Duchesse Bleue*, *Drames de Famille*, and *Voyageuses* (1898); *Trois Petites Filles* and *Mensonges* (1899); *Un Homme d'Affaires* (1900); *Le Fantôme* (1901); *Monique* and *L'Etape* (1902); and *Le Divorce* (1904). A collected edition of his works began to appear in 1900.

Bourguignons—*i.e.* BURGUNDIANS—the name of a political party in France, which, during the civil war (1410–35), was opposed to the Armagnacs. They were so called from their chief, John the Fearless, Duke of Burgundy (Bourgogne), and represented the popular party, being supported by the bourgeoisie of the big towns in the north of France. The struggle between these parties was ended by the treaty of Arras (1435), concluded between Charles VII., king of France, and Philip the Good, Duke of Burgundy.

Bourignon, ANTOINETTE (1616–80), a French 'visionary,' and founder of a sect called by her name, was born at Lille. To avoid a marriage, she fled from her father's house; and on her father's death (1648) she became head of a hospital in Lille (1653–62). After that she proceeded to Holland and the north-west of Germany. The leading idea of her system was that religion consists in elevated emotions, not in knowledge and practice. The Bourignonists spread from Holland to Germany, France, Switzerland and even to Scotland (early 18th century), and held a position not unlike that of the Swedenborgians in later times. An edition of Bourignon's tracts (19 vols.) was published in Amsterdam (1686), to which is prefixed her *Life*. Three of these were translated into English—*Treatise of Solid Virtue* (1699), *Restoration of the Gospel Spirit* (1707), and

An Abridgment of the Light of the World (1786).

Bourinot, Sir John George (1837 – 1902), British historian, became clerk to the Canadian House of Commons in 1880; he was created K.C.M.G. in 1898. He published *Canada* ('Story of the Nations Series,' 1898); *How Canada is Governed* (1895); *Parliamentary Procedure and Government in Canada* (1884); *Cape Breton and its Memorials of the French Régime* (1892); *Builders of Nova Scotia; Canada Under British Rule* (Cambridge Hist. Series; new ed. 1901); *Constitutional History of Canada* (new ed. 1901).

Bourke, Richard Southwell. See Mayo, Earl of.

Bourmont, Louis Auguste Victor de Ghaisnes, Comte de (1773–1846), marshal of France was born in the department of Maine-et-Loire. He became an officer of the French Guards, and in 1791 fought on the side of the royalists. He took a prominent part in the civil war in La Vendée, but on his return to Paris in 1799 incurred Napoleon's suspicion, and was imprisoned. After his escape he became reconciled to Napoleon, and served (1808–15) with distinction in Naples, Russia, and Germany. On Napoleon's flight from Elba he was appointed to a division, but subsequently joined the Bourbons, and in 1823 was appointed commander of the army sent into Spain. On his return to France he was created a peer. In 1829 he became minister of war. He commanded in the invasion of Algeria (1830), for which service he was promoted to the rank of marshal. But he declined to take the oath of allegiance to Louis Philippe (1830), and lived for some time in England.

Bourne, Edward Gaylord (1860–1908), Amer. author and educator, was b. of Pilgrim descent, at Strykersville, N. Y., and graduated (1883) at Yale, where he remained as a graduate student until 1888, lecturing on political science during the last two years of his stay. From 1888 to 1895 he was instructor and professor of history at Adelbert College, Cleveland, O., being appointed in the latter year to the chair of history at Yale. Author of *Essays in Historical Criticism* (1901), *Spain in America* (1904), and *Life of John Lothrop Motley* (1905); and associate editor of the *Yale Review*.

Bourne, George (1780–1845), American clergyman, was born at Westbury, Wiltshire, England, and coming to America set up a printing establishment at Harrisburg, Pa., for the education of his parishioners. He was an early abolitionist and wrote and preached against slavery. His activity in this direction obliged him to remove to Germantown, Pa., and other places. He finally settled in New York, where he edited the *Protestant Vindicator*. Among his books were *The Book and Slavery Irreconcilable* (1815) and *Slavery Illustrated in its Effects upon Women* (1834).

Bourne, Hugh (1772–1852), founder of the Primitive Methodists, was a carpenter and builder; became local preacher among the Wesleyan Methodists, and in 1802 built a chapel at Harriseahead, near Newcastle-under-Lyme. In 1807, in imitation of the practice in the U. S., he began to hold large camp meetings for the revival of religion; and though the conference the same year passed a resolution condemning such meetings, Bourne continued to hold them, the result being his summary expulsion from the society (1808). Only when convinced that his expulsion was final did Bourne proceed to establish a new denomination. The first general meeting of the new society was held at Tunstall in 1811; the name, 'Primitive Methodists,' was adopted in 1812. See J. Walford's *Memoirs of H. Bourne* (1855); J. Petty's *Primitive Methodist Connection* (1864).

Bourne, Jonathan, Jr. (1855), American legislator, was born in New Bedford, Mass.; settled in Portland, Ore., in 1878; admitted to the bar in 1881; abandoned law practice for mining and other operations; elected U. S. Senator (Rep.) for the term 1907–13.

Bourne, Vincent (1695–1747), English poet, became a master at Westminster, where Cowper was one of his pupils, and in 1734 was appointed deputy sergeant-at-arms to the House of Commons. His *Poëmata* appeared in 1734. Translations from his verse appear in Cowper and Lamb. See his *Poëmata*, ed. by Mitford, with Memoir (1840).

Bournemouth, wat.-pl., munic. and co. bor. on the S. coast of England, on Poole Bay, with two stations on the London and South Western Ry., 5 m. S.W. of Christchurch, Hampshire. Originally a small fishing village, it was not until the middle of the 19th century that it came into notice as a health resort. It was incorporated in November, 1890. Its position on the coast and in the pine-sheltered valley traversed by the Bourne, its equable climate, its fine stretch of sand, and its magnificent views, especially from W. Cliff, make it an ideal seaside resort. It is beneficial to consumptive patients, and there are numerous hospitals and homes. Pop. (1861) 1,940; (1881) 16,858; (1901) 47,003.

Bourrienne, Louis Antoine Fauvelet de (1769–1834), French diplomatist, born at Sens, was a fellow-student of Napoleon at Brienne, and in 1797 became confidential secretary to Napoleon. He was minister plenipotentiary to Hamburg in 1804, but was dismissed in 1810 by Bonaparte, on a charge of peculation; and in 1814 he deserted the cause of his former patron for that of Louis XVIII., by whom, in 1815, after Waterloo, he was appointed minister of state. The loss of his fortune at the time of the revolution of 1830 affected his reason, and he spent the last two years of his life in an asylum at Caen. His *Mémoires* appeared in 1829–31 (new ed. 1899–1900), and caused a sensation for their Napoleonic details. But they are unreliable, and their mistakes were exposed by Boulay de la Meurthe in *Bourrienne et ses Erreurs Volontairs et Involontairs* (1830).

Bourse, the European name for a stock exchange or money market, of which the most important are those at Paris, Berlin, and Vienna. The Paris Bourse is a handsome Grecian building with Corinthian pillars, designed by Alex. Théod. Brongniart (1813), and completed by Labarre in 1827. See Stock Exchange.

Bouscat, Le, tn., dep. Gironde, France, 3 m. N.W. of Bordeaux, of which it is a suburb; has a hydropathic establishment. Pop. (1901) 10,446.

Boussa, or Bussa, or Bussang, tn., kingdom of Gando, W. Sudan, on the Niger. Here, in 1806, Mungo Park, the traveller and explorer, was murdered. Pop. 12,000.

Boussingault, Jean Baptiste Joseph Dieudonné (1802–87), French chemist, who, after travelling in company with Bolivar the Liberator through Colombia, Peru, and Venezuela, became professor of chemistry at the Sorbonne in Paris (1839). He carried on investigations into the composition of the atmosphere, and studied poisons; but his most important work was in agricultural chemistry. See his *Economie Rurale* (1844; Eng. trans. 1845; newer ed. in 8 vols. 1860–91).

Boussu, tn., prov. Hainault, Belgium, 7 m. by rail W. of Mons; has coal mines, copper and iron foundries, engineering and boatbuilding works. Pop. (1900) 10,932.

Bouterwek, Friedrich (1765–1828), German philosopher, poet, and critic, was appointed professor of philosophy at Göttingen in 1797. He wrote *Ideen zu einer allgemeinen Apodiktik* (1799), and *Aesthetik* (1806), but is remembered chiefly for his *Geschichte der neuern Poesie u. Beredsamkeit* (1801–19).

Bouts, Dierick (d. 1475), also called Stuerboudt and Thierry de Haarlem, Dutch painter, was probably Van der Weyden's pupil. He was appointed municipal painter at Louvain about 1468. His manner is rather stiff; his personages are imposing, with long heads and fixed expressions. Among his works are *The Judgment of the Emperor Otho* (Brussels), *Martyrdom of St. Erasmus*, and *Last Supper* (St. Pierre, Louvain—the wings of this are in the Berlin and Munich galleries); Vienna and Bruges also have pictures by him. The *Exhumation of Bishop Hubert*, in the National Gallery, London, has been ascribed to him. See F. T. Kugler's *Handbook of Painting: Dutch, German, and Flemish Schools* (new ed. 1879).

Bouts-rimés (Fr. 'rhymed ends'), a poetical amusement, very popular in French literary circles in the 17th and 18th centuries, in which the rhymes of a poetical composition are prescribed in their due order, and the contestants are required to compose verses to suit them. Alex. Dumas published a collection of *bouts-rimés* in 1865. See Addison's *Spectator*, No. 60.

Boutwell, GEORGE SEWALL (1818–1905), American lawyer and statesman, born at Brookline, Mass. He was admitted to the Mass. bar in 1836, soon entered politics as an Anti-Slavery Democrat, was a member of the lower house of the Mass. Legislature (1842–4 and 1847–50), was governor of Massachusetts (1851–3), and was secretary of the Mass. Board of Education (1855–61). He was one of the organizers of the Republican Party in Mass., was a delegate to the Republican National Convention in 1860, became the first commissioner of internal revenue (1862), was a member of Congress (1863–9), and was one of the seven who conducted the impeachment of President Johnson (1868). During Pres. Grant's first term he was Secretary of the Treasury (1869–73), and subsequently was a member of the U. S. Senate (1873–7). He disapproved of his party's policy with regard to the Philippines after the Spanish-American War, and in 1900 was president of the Anti-Imperialist League. He published *Educational Topics and Institutions* (1858); *Manual of the United States Direct and Revenue Tax* (1863); *Why I am a Republican: History of the Republican Party* (1884); *The Lawyer, the Statesman, and the Soldier* (1887); *The Constitution of the United States at the End of the First Century* (1895), and *Reminiscences of Sixty Years in Public Affairs* (1902).

Bouvardia (named after Bouvard, physician of Louis XIII.), a genus of plants of the Rubiaceæ. They are natives of Mexico; possess a tubular, four-lobed corolla with four stamens; and the fruit consists of a two-celled capsule. They are greenhouse plants, cultivated for their showy, mostly orange or red, flowers.

Bovidæ (forms 'like oxen'), a family of mammals which includes all the hollow-horned ruminants, and therefore the most specialized types of the artiodactyle ungulates. The members of the family are commonly known as antelopes, sheep, goats, and oxen, but the different types are not very sharply separated from one another. They show their specialization in the development of horns, in the complex stomach which makes the act of rumination possible, in the nature of the teeth, and in the structure of the limbs. The family is widely distributed, but it is a remarkable fact that no hollow-horned ruminant is indigenous to S. America, though those introduced by Europeans have thriven amazingly, and become half wild. See CATTLE.

Bow. See ARCHERY.

Bow. See VIOLIN.

Bow, or STRATFORD-LE-BOW, suburb of London.

Bowdich, THOMAS EDWARD (1791–1824), African traveller; born at Bristol, England; conducted a mission to Ashanti (1816), and was the first to open up that part of the interior of Africa. He set out on a second expedition in 1822, but died of fever at Bathurst, on the Gambia. His works include *Mission from Cape Coast Castle to Ashanti* (1819), *Discoveries of the Portuguese in Angola and Mozambique* (1824), and the *Description of the Island of Madeira*, published in 1825 by his wife.

Bowditch, HENRY INGERSOLL (1808–92), American physician, son of Nathaniel Bowditch (q.v.), was born at Salem, Mass., and graduated (1828) at Harvard where and in Paris (1833–5) he received his medical education. Dr. Bowditch on his return from abroad established at Boston a private medical school in which instruction was given similar to that afterward given in post graduate schools. He became an authority on pulmonary diseases, and published a series of papers on this subject, being also the first to practise the puncturing of the chest cavity in cases of pleural effusions. He was an ardent abolitionist, and was respected for his honesty, even by his adversaries. During the Civil War Dr. Bowditch promoted the adoption of a proper ambulance service by the government and finally effected his purpose. He was professor of clinical medicine at Harvard, 1859–67, and held state and urban medical offices.

Bowditch, NATHANIEL (1773–1838), American astronomer and mathematician, was born at Salem, Mass., and during a strenuous youth, in which he was a cooper, ship-chandler, clerk, supercargo, and shipmaster, he devoted himself to the study of practical mathematics. He sailed as supercargo of a merchant ship in several voyages in order to complete his studies in navigation by practical experience. Refusing the offer of a professorship at Harvard, he became actuary (1823) to an insurance company. He published a *New American Practical Navigator* (1802), and a translation of Laplace's *Mécanique Céleste* (1829–38). See *Life* by his son, J. Bowditch (1839).

Bowdler, THOMAS (1754–1825), editor of the expurgated Shakespeare, practised as a physician, and devoted himself subsequently to philanthropic work in London, the Isle of Wight (1800–10), and Rhyndings, near Swansea. Bowdler's reputation depends on his '*Family Shakespeare in ten volumes; in which nothing is added to the original text; but those words and expressions are omitted which cannot with propriety be read aloud in a family*,' (1818)—a work whose method has given us the term 'to bowdlerize' (first used in General Peronet Thompson's *Letters of a Representative to his Constituents*, 1836).

Bowdoin, JAMES (1727–90), American statesman, was born in Boston, Mass., and graduated (1745) at Harvard, falling heir to his father's large fortune two years later. Bowdoin was a friend of Benjamin Franklin, to whom he communicated some of his own discoveries in physics. He was a member of the Mass. General Court (1753–6), and was a member of the council thereafter until the outbreak of the Revolution, being a constant opponent of the royal governors with voice and pen. He was hampered by ill-health during the war, taking local office only, but was governor of Mass., 178 –7, and in that capacity put down Shays's rebellion. Gov. Bowdoin was a founder and the first president of the American Academy of Arts and Sciences, was prominent in other public ways, and Bowdoin College was named in his honor.

Bowdoin, JAMES, 2d (1752–1811), American philanthropist, son of the foregoing, was born in Boston, Mass., graduated (1771) at Harvard, and passed several years in study and travel abroad. He served in the Mass. Legislature and was a member of the state constitutional convention in 1789. He was appointed U. S. minister to Spain, 1805, and, being unsuccessful in an effort to adjust matters in dispute with that country, returned in 1808. He presented Bowdoin College, named in honor of his father, with 6,000 acres of land, and bequeathed to it his extensive collections of books and philosophical appliances made in Europe and the reversion of Naushon Island.

Bowdoin College, bō′d'n, an institution of higher learning for men in Brunswick, Me. It was incorporated by the General Court of Massachusetts in 1794 and named in honor of James Bowdoin, a former governor. The earliest patron of the college was James Bowdoin, son of the governor, who bequeathed to it land, money, and his valuable library and art collection. It was opened in 1802. By order of the governing boards the total number of students residing in college is limited to about 500, the Freshman class being limited to about 150. The college confers the degrees of A.B. and B.S. and the honorary degrees of A.M., SC.D., LITT.D., D.D., L.H.D., and LL.D.

The principal buildings are Massachusetts Hall; the dormitories, Maine Hall, Winthrop Hall, William De Witt Hyde Hall, and Appleton Hall; the Chapel; Seth Adams Hall; Memorial Hall; the Observatory; Walker Art Building; Hubbard Hall, which houses the library of 140,000 volumes; the Mary Frances Searles Science Building; the Sargent Gymnasium; Hyde Athletic Building; and the Dudley Coe Memorial Infirmary. For recent statistics see Table under the heading COLLEGE.

Bowel. See INTESTINES.

Bowen, bō′en, FRANCIS (1811–90), American philosophical writer, was born in Charlestown, Mass. He was graduated (1833) from Harvard, where he later became lecturer on philosophy and political economy, and afterward (1854) professor of natural religion, moral philosophy and civil polity, being an advocate of the views held by Locke and Berkeley, as opposed to those of Comte, Kant, Mill, and others. He was editor of the *North American Review* (1843–54); and is the author of *American Political Economy* (1870); *Modern Philosophy* (1877), *Gleanings from a Literary Life* (1880), *A Layman's Study of the English Bible* (1886).

Bowen, SIR GEORGE FERGUSON (1821–99), British colonial governor, was born in Ireland. He was chief-secretary to government in Ionian Islands (1854–9), and was successively governor of Queensland (1859–67), New Zealand (1868–72), Victoria (1873–9), Mauritius (1879–82), and Hongkong (1883–7). He was knighted in 1856. His works include *Ithaca in 1850* (1850; 3rd ed. 1854), which he identified with the Ithaca of the *Odyssey; Mount Athos, Thessaly, and Epirus* (1852); *Imperial Federation* (1886), and Murray's *Handbook for Travellers in Greece* (1854; 6th ed. 1896); *Thirty Years of Colonial Government* (1889).

Bowen, HENRY CHANDLER (1813–96), American publisher, was born in Woodstock, Conn. At the age of twenty he began work as a clerk in a dry-goods house in New York, and five years later he organized his own dry-goods firm of Bowen & McNamee. In 1848 he and three associates established *The Independent* as an anti-slavery Congregationalist paper, with four Congregational clergymen as editors. On the retirement of these editors, in 1861, the paper was made undenominational, with Henry Ward Beecher as editor. The latter was succeeded by Theodore Tilton, and, in 1871, Bowen himself assumed the editorship. When his firm was boycotted in the South because of his denunciation of the Fugitive Slave Law, Bowen & McNamee issued a card stating that 'our goods, and not our principles, are on the market.'

Bowenite, a variety of serpentine found in Smithfield, R. I. It is light green in color, resembling jade, and is noteworthy for its fine texture and hardness.

Bow′er, ARCHIBALD (1686–1766), British ecclesiastical historian, was born near Dundee, Scotland. He was educated at Douay and at Rome, where he joined (1706) the Society of Jesus. He then served (1723–6) on the Court of the Inquisition, but returned to England in 1726 and became a Protestant, though later he rejoined (1745) the Catholic communion. He edited the *Universal History* (1735–44), and wrote a *History of the Popes* (1748–66).

Bower, or BOWMAKER, WALTER (1385–1449), Scotch historian, 'the continuator of Fordun's *Scotichronicon*,' was born in Haddington. At the age of eighteen he assumed the religious habit, and went to Paris to study civil and canon law. On his return to Scotland in 1418 he was elected abbot of Inchcolm, in the Firth of Forth. On the death of Fordun he completed the *Scotichronicon*, continuing the narrative to the death of James I. (1437). The only complete edition of the text is that of Goodall (1759); there is no complete translation.

Bowerbank, JAMES SCOTT (1797–1877), English geologist was born in London. He was one of the founders of the London Clay Club (1836), and of the Palæontological Society (1847) and made an exhaustive study of fossil and living British sponges. His publications include *A Monograph of British Spongiadæ* (Ray Society, 1864–82), and *Fossil Fruits of the London Clay* (1840). His fine collection was purchased (1864) by the British Museum.

Bower-bird, a name applied to several different birds inhabiting the Australian region and belonging to the family Ptilonorhynchidæ. They are all small birds, from 8 to 14 inches long, with a stout bill and, in some species, brilliant plumage. They are characterized by a remarkable habit of constructing bowers or runs, which have nothing to do with nesting, but are apparently built only for sport and æsthetic satisfaction. Certain species—*e. g. Scenopœetes dentirostris*—make clearings in the forest, and decorate these with leaves, berries, and flowers. The species of *Prionodura* build bowers or huts between trees, the main hut being decorated with ferns and moss, and surrounded by smaller structures. Most remarkable of all is the 'garden' and hut of *Amblyornis inornata*. The hut is of elaborate structure, with a central cone of moss, and a surrounding gallery built of orchid stems, open in front to the lawn or 'garden,' which is some nine feet in diameter, and consists of a bed of bright green moss, decked with brilliant flowers and berries. It appears probable that it is the males who construct the bowers, apparently as places in which they may display themselves before their mates.

Bowers, ELIZABETH CROCKER (1830–95), American actress, was born in Stamford, Conn. She made her first appearance on the stage as Amanthis at the Park Theatre, New York, in 1846. She married her fellow-actor, David P. Bowers, the following year, and on their removal to Philadelphia she acted at the Arch Street Theatre of that city, where she became a favorite. After successful performances in Great Britain, she returned to New York and appeared for a while at the Winter Garden. Among her notable roles were Julia in *The Hunchback*, Lady Macbeth, and Juliet.

Bowfin, or MUD-FISH (*Amia calva*), a ganoid fish found in still water in the Mississippi Valley and the Great Lakes region and known locally as 'grindle,' 'lawyer,' or 'dogfish.' It is about two to two and a half feet long, dark mottled green in color. It is voracious and extremely tenacious of life, being an excellent game fish, although its flesh is not appetizing.

Bowie-knife, bō′i *or* bo͞o′i, the heavy sheath knife of the early Southwestern States, called after Colonel James Bowie of Texas

(1790–1836), who invented it. The wide, curved blade is about a foot long.

Bow-legs, or GENU-VARUM, a bending of the femur or tibia or both, with convexity outwards. It may occur in one leg only, following an accident or operation; but it is usually found in both legs, and the trouble starts when the child begins to walk. The usual cause is rickets, which renders the skeletal structure of the lower limbs unfit to bear the weight of the body, so that the bones curve both in the thigh and below the knee, which becomes the most prominent point of the convexity. Bow-legs are also induced by certain occupations, as that of postilion or jockey, followed before the bones have attained full growth and hardness. When the deformity is restricted to the part below the knee, the bones have a forward or outward convexity, or a double curve, caused by rickets.

Treatment depends upon the cause of the deformity and the age of the patient. In a rickety case diet and general hygiene are even more important than local treatment, which, however, must not be neglected. Full rest, on the back. is important; and the nurse can assist by systematic straightening and stretching of the limbs, and by daily massage. The bending of the long bones depends on the amount and direction of the pressure to which they are subjected. It does not occur to any extent in infants who are kept lying flat. In more pronounced cases, treated while the bones are still soft, the legs are often bandaged together, or to splints on the inner side of the curvature or with plaster casts. Later, when the disease process has healed and the bone is firmer, osteoclasm, or the breaking of the bone and setting it straight in splints, is performed. In the case of strong, fully-grown bones osteotomy is practised—an operation involving the removal of wedge-shaped portions of bone.

Bowles, bōlz, CAROLINE. See SOUTHEY.

Bowles, FRANCIS TIFFANY (1858–), American naval architect, was born in Springfield, Mass. He was graduated (1879) from the U. S. Naval Academy at Annapolis, subsequently taking a course in naval architecture at the Royal Naval College, Greenwich, England. He was appointed assistant naval constructor in the U. S. navy, 1881, was promoted naval constructor, 1888, and from 1901 to 1903, was chief constructor of the U. S. navy, with the rank of rear-admiral. He resigned from the navy in 1903 and became president of the Fore River Shipbuilding Corporation, Quincy, Mass. In 1917–19 he was assistant general manager of the U. S. Shipping Board Emergency Fleet Corporation.

Bowles, SAMUEL (1826–78), American journalist, was born in Springfield, Mass. He received a high school and private education and at the age of seventeen began work as office-boy on his father's paper, the *Republican*, then a weekly. At his suggestion the *Republican* was made a daily the following year (1844), and at first he was concerned chiefly with its management, but became increasingly associated with the editorial department, with which Dr. J. G. Holland was also connected. On the death of his father in 1851, Bowles became sole manager of the paper, which had by that time achieved an enviable reputation. The *Republican* maintained an aggressive attitude both before and during the Civil War. Bowles supported Greeley in the presidential campaign of 1872, after which the *Republican* became an independent paper. He travelled extensively in the United States and Europe. He published *Across the Continent* (1865) and *The Switzerland of America* (1869).

Bowles, WILLIAM LISLE (1762–1850), English poet and antiquary, was born in Northamptonshire. He was educated at Oxford, took orders and after a few years as rector in Chicklade, in 1804 became rector of Bremhill in Wiltshire, where he remained until his death. From 1828 he was canon residentiary of Salisbury Cathedral and after 1818 was chaplain to the prince regent. His first and best work, *Fourteen Sonnets on Picturesque Spots* (1789), met with a warm reception and is said to have been greatly admired by Coleridge and Wordsworth. His subsequent poetical works are numerous. but not of great merit. Among them are *Verses to John Howard* (1789), *The Spirit of Discovery* (1805), *The Missionary of the Andes* (1815), *St. John in Patmos* (1833). In 1807 appeared his edition of Pope, and his strictures on the classical theory of verse gave rise to a long discussion, in which his chief opponents were Lord Byron, Campbell, and the *Quarterly Review*.

Bowling, a game developed from that of lawn bowls, first played in London in about the 12th century. The first record of a match game in America was in New York City in 1840, and since that time the game has steadily grown in favor until it is played in almost every city and town in the United States. Until 1875 there was much diversity as to the length of the alleys and the size of the pins, and at that time a set of rules was made by a number of players in convention, which served their purpose for about twenty years. By 1895 the game had become so widespread that a new set of rules was necessary and the American Bowling Congress was formed which made new laws for the game which have, with some modifications, existed to the present time. The alleys upon which the game is played are perfectly level, of polished wood, and are not less than 41 or more than 42 inches wide, with a gutter on each side, and must be 60 feet from the head pin to the foul line, which the bowler may not pass before dropping the ball. Back of the foul line there must be a clear run of fifteen feet, and at the other end of the alley there must be a pit for the reception of the balls and the pins as they are knocked down. The pin spots, upon which the ten pins are placed at the beginning of the game, must be clearly described or imbedded in the alleys and be placed 12 inches apart from centre to centre, and be 2¼ inches in diameter. The pins must be set in pyramidal form, four at the pit end of the alley three inches from the pit edge measuring from the centre of each pit spot, and the head pin must be in the middle of the alley.

The pins must be fifteen inches high, 2½ inches in diameter at their base, 15 inches in circumference at a point 4½ inches from their base, 11⅝ inches in circumference at a point 7¼ inches from their base, 5¼ inches in circumference at their neck, a point 10 inches from their base, and 8 inches in circumference at their head, a point 13½ inches from their base. They are made of hard maple, having a minimum weight of 3 pounds, 2 ounces. The ball must not exceed 27 inches in circumference or 16½ pounds in weight, although it may be as much smaller as the player desires.

The game may be played by any number, each player in turn rolling ten frames, or innings. Each player rolls two balls except when he makes a strike or when a tenth strike or spare is made in the tenth frame. A strike is when the player bowls down all ten pins with his first ball and is designated by an X in the upper right-hand corner of the frame, and the count is left open until the player shall have rolled his next two balls, when all pins made on the three balls are counted in the first frame or inning. Thirty is the highest number which can be made in any frame. A spare is made when a player bowls down all ten pins with two balls and is mour of the British navy. The allied troops again advanced, and after heavy fighting at Tien-tsin, Pei-tsang, and Yang-tsun, succeeded in relieving the besieged on Aug. 14, 1900. The court fled from the capital, and the allies remained in possession until peace was signed on Sept. 7, 1901, one of the conditions of which was that China should pay $320,000,000 as indemnity to the foreign powers. The share allotted to the United States was $24,500,000. By 1908 China had paid about $9,000,000, and Congress then remitted half of the total indemnity. For this act China sent official thanks and announced that the sum remitted would be used to send Chinese students to the United States.

Box Fish. See COFFER FISH.

Boxhauling, a mode of turning a ship, when the swell of the sea renders tacking impossible, or when the ship is too near the shore to allow room for veering. The operation is effected by hauling the head sheets to windward, bracing the head yards aback, and squaring the after yards, the helm at the same time being put alee. *Boxing off* is a similar operation.

Boxing, or PUGILISM, the art of fighting with the fists, generally with padded gloves. The development of modern boxing dates from the early eighteenth century. The sport was first brought into prominence by James Figg, in London, in 1719, and became popular in 1734–50, when Jack Broughton flourished. To this noted boxer we are indebted for the invention of the boxing glove, or muffler as it was then called, as well as for the first code of rules, from which those at present in force have been developed. After Broughton's death, pugilism declined in favor for a time; but John Jackson, the first 'gentleman' fighter, restored its popularity. Then began the period of highest prosperity for the ring in England, which lasted until the retirement of Tom Spring in 1824. From that time interest in the sport declined in Great Britain, although the contest between Sayers, an Englishman, and Heenan, an American, in 1860, caused a temporary revival of enthusiasm.

Much of the scientific development of boxing has originated in the United States, and there most of its professional champions have lived. Though the prize fight to a finish, or 'knock out,' is now forbidden in nearly all the States, limited-round bouts between professionals, under varying legal restrictions (*e.g.*, that no decision shall be announced), are of frequent occurrence in the larger cities. Amateur boxers form a numerous host, and many of the foremost athletic clubs promote the sport by holding boxing tournaments. Annual championships are conducted under the auspices of the Amateur Athletic Union.

Boxing contests in America are governed by the Marquis of Queensberry Rules, frequently modified in minor points by the principals or their managers. The ring is a roped arena, from 16 to 24 feet square. Eight-ounce gloves are used in amateur and most professional contests.

The six main fighting classes or weights are the Bantam (116 lbs.), Feather (122), Light (133), Welter (145), Middle (158), and Heavy (over 158 lbs.).

Since the days of John L. Sullivan, the United States has boasted an unbroken series of professional heavy-weight champions, though all have not been born in America, and one title holder (Jack Johnson) was a negro.

BOXING: *Heavy-weight Contests of Recent Years*

Year	Date	Where Fought	Winner	Loser	Rounds
1892	Sept. 7	New Orleans, La.	James J. Corbett	John L. Sullivan	21
1897	Mar. 17	Carson City, Nev.	R. Fitzsimmons	James J. Corbett	14
1899	June 19	Coney Island, N. Y.	James J. Jeffries	R. Fitzsimmons	11
1900	May 11	Coney Island, N. Y.	James J. Jeffries	James J. Corbett	25
1903	Aug. 14	San Francisco, Cal.	James J. Jeffries	James J. Corbett	10
1910	July 4	Reno, Nev.	Jack Johnson	James J. Jeffries	15
1915	April 5	Havana, Cuba	Jess Willard	Jack Johnson	26
1919	July 4	Toledo, Ohio	Jack Dempsey	Jess Willard	3
1921	July 2	Jersey City, N. J.	Jack Dempsey	Georges Carpentier	4
1923	Sept. 14	New York City	Jack Dempsey	Angel Firpo	2
1926	Sept. 23	Philadelphia, Pa.	Gene Tunney	Jack Dempsey	10
1927	Sept. 22	Chicago, Ill.	Gene Tunney	Jack Dempsey	10
1928	July 26	New York	Gene Tunney	Thomas Heeney	11

Boxing Rules.—In boxing competitions the result is usually decided by the *Marquis of Queensberry Rules,* which are principally as follows: A boxing match shall be a fair stand-up contest in a 24-foot ring, or as near that size as practicable. No wrestling or hugging shall be allowed. The rounds shall be of three minutes' duration, with one minute's time after each round. If either man fall, he must get up unassisted, ten seconds to be allowed him to do so. When he is on his legs again the round is to be resumed, and continued until the three minutes have expired. If he fails to come to scratch in the time allowed, the referee may award the match to the other. A man on one knee is considered down, and if struck is entitled to the stakes.

The rules for the London prize ring are used to settle other points, especially fouls, which are blows struck when a man is down, blows below the waistband, butting with the head, biting, kicking, etc.

Consult *Boxing* (Spalding's Athletic Library); Trotter's *Practical Treatise on Boxing;* Wignall's *The Story of Boxing* (1923).

Boxing Day, an English bank holiday falling on the day after Christmas and so called because on that day Christmas boxes were given to employees. The actual origin of the holiday is obscure.

Boxtel, boks'el, town, Netherlands, in the province of North Brabant; 7 miles south of 's Hertogenbosch (Bois-le-Duc). It has manufactures of linens, paper, and salt. Here, in 1794, the French defeated the allied Dutch and English. Pop. (1920) 9,677.

Box-thorn (*Lycium*), a genus of Solanaceæ, having funnel-shaped or tubular flowers, and two-celled berries. *L. vulgare,* the Matrimony Vine, a Southern European shrub, cultivated in the United States, has small, narrow grayish green leaves, and purplish or violet-colored flowers followed by scarlet or black berries.

Boyacá, bō-yä-kä', or BOJACA, department, Colombia, having the republic of Venezuela on its eastern frontier, and traversed by the Eastern Cordilleras of the Andes; area, 16,460 square miles. There are fertile lowlands and extensive prairies; among the mountains, numerous minerals are found, especially emeralds. Cattle raising is the chief industry. Pop. (1918) 311,300.

Boyacá, town, Colombia, in the department of Boyacá; 70 miles northeast of Bogotá. It was the scene of the victory of General Bolivar over the Spaniards (Aug. 7, 1819), by which Colombia secured her independence. Pop. 7,000.

Boyar, bō-yär', the highest rank, military and civil, next to *knyaz* (prince), in the old Russian aristocracy. Before the organization of the empire under Peter the Great, the boyars, at first a nobility of office, had considerable independence in the separate principalities, and might withhold consent to any ukase of the Czars. Peter the Great finally abolished the order by giving them a place among the Russian nobility, but at the same time stripping them of their peculiar privileges.

Boy Bish'op. On St. Nicholas' Day (Dec. 6) in the mediæval church, it was the custom to allow choir boys of churches to choose one of their number who acted as boy bishop until Holy Innocents' Day (Dec. 28). The custom also prevailed in England in the schools of Eton and Westminster. The boy bishop, attired in suitable vestments and attended by a number of assistants, travelled about, blessing the people, and performing many of the episcopal ceremonies. The practice was abolished in England in the reign of Elizabeth, and on the Continent by the Council of Basel (1431).

Boy'cott, a term originating in 1880 during the struggle between the Irish Land League and the English landlords. The harsh exactions of Captain Boycott, agent of Lord Erne, led the tenantry to organize a movement to hold no dealings with him or his family. The word 'boycott,' coined at that time to describe the action of the tenants, later came to indicate the concerted refusal of organized workers to purchase commodities produced in a shop whose management refused to apply trade-union wage rates and working conditions. This concerted action usually included, also, efforts to persuade others to divert their patronage from the 'unfair' concern—the so-called 'secondary boycott.' In three cases carried to the U. S. Supreme Court it has been decided that the boycott is a combination in restraint of trade, and therefore illegal.

Danbury Hatters Case.—In July 1902, the employees of the firm of D. E. Loewe & Co., hatters, of Danbury, Conn., went on strike, with the main object of securing a union shop. The strikers were aided by their national organization, the United Hatters of America, while the company was supported by the American Anti-Boycott Association. The boycott was not only primary but secondary—i.e., the strikers and their friends not only refused to buy the firm's goods, but organized boycotts against all firms selling these goods.

The case was eventually carried to the U. S. Supreme Court, which on Feb. 3, 1908, handed down a decision: (1) that the United Hatters of America was 'a combination in restraint of trade or commerce' under the Sherman Anti-Trust Act; and (2) that individual members of the Danbury hatters' union could be held liable for damage of three times the amount of the actual loss inflicted, costs, and attorney's fees. On Jan. 5, 1915, the same tribunal held that use of the primary and secondary boycott and the circulation of a list of 'unfair dealers' to persuade customers of Loewe to withhold their patronage was actionable, and affirmed the judgment of the U. S. district court of Oct. 11, 1912, awarding damages which totalled $252,130 in favor of the plaintiffs.

Buck's Stove Case.—In 1906, the union metal polishers employed by the Buck's Stove and Range Company of St. Louis, Mo., went on strike because of the firm's refusal to reinstate certain polishers who had been discharged in a dispute over the length of the working day. The company thereupon announced its refusal to have any dealings with the representatives of organized labor, and its intention of operating an 'open shop,' an action which involved other unions as well. The American Federation of Labor having failed to effect a settlement, the executive council of the Federation declared the Buck's Stove and Range Company an 'unfair concern' (March 1907), and published its name in the 'we don't patronize' list of *The American Federationist.* In addition, a vigorous secondary boycott was initiated. Suit was thereupon brought by the company to enjoin the Federation from continuing the boycott; and on Dec. 18, 1907, Judge Gould, of the Supreme Court of the District of Columbia, issued an injunction against a continuation of the boycott.

In December 1908, Justice Wright, of the Supreme Court of the District of Columbia, adjudged the three labor leaders, Samuel Gompers, John Mitchell, and Frank Morrison, guilty of contempt for violation of the injunction and sentenced them to imprisonment. In 1909, on application of the American Federation of Labor, the sweeping injunction of 1907 was substantially modified by the Court of Appeals of the District of Columbia, but the sentence for contempt was upheld. In May 1911, the U. S. Supreme Court reversed the judgment of the lower court without denying the right to punish the defendants for contempt. New action for contempt having been begun in the Supreme Court of the District of Columbia, the original judgments were reimposed (June 1912); they were subsequently reduced (May 1913) by the District Court of Appeals, and eventually set aside by the U. S. Supreme Court (May 1914), under the Statute of Limitations (see LIMITATIONS, STATUTES OF).

Duplex Printing Company Case.—Between 1909 and 1913 the International Association of Machinists induced three of the four printing press manufacturers of the United States to recognize the union. The fourth, the Duplex Printing Press Company, of Battle Creek, Mich., having refused such recognition, the machinists' union declared a strike at the Battle Creek factory; while District No. 15 of the International Association instructed its members not to work on the installation of presses which the company had delivered in New York, and undertook to persuade other workers not to handle the presses, and customers to divert their patronage to other concerns. The Duplex Company brought suit, under the Sherman Anti-Trust Act, to restrain the officials of the New York Machinists Union from continuing the boycott. The U. S. Circuit Court of Appeals denied the injunction on the ground that the Clayton Act amended the Sherman Act to the extent of legalizing the secondary boycott. This decision was reversed by the U. S. Supreme Court, which in a majority opinion handed down on Jan. 3, 1921, applying its decision in the Danbury Hatters Case, affirmed that the machinists' boycott was a restraint of trade prohibited by the Sherman Act.

In addition to its use in labor disputes the boycott is not infrequently employed in certain forms of mass action, as consumers' boycotts, buyers' strikes, etc. It also includes the practice of social and political ostracism (q. v.), which has been known for centuries.

Certain of the States have statutes in definite terms prohibiting the boycott; while a majority of the others have enacted laws designed to render the practice illegal. See BLACK LIST.

Boyd, ERNEST AUGUSTUS (1887–), American journalist, critic and translator, was born in Dublin, Ireland. He was educated abroad and in 1913 entered the British Consular Service, serving in the United States, Spain and Denmark. In 1920 he resigned from the service, settled in New York City and for two years was on the editorial staff of the *Evening Post.* From 1922 to 1923 he was literary adviser for the Knopf publishing house. His published works include *Contemporary Drama of Ireland* (1917); *Ireland's Literary Renaissance* (1922); *Portraits—Real and Imaginary* (1924); *Studies in Ten Literatures* (1925); *Literary Blasphemies* (1926); besides many translations of Anatole France, Guy de Maupassant and others.

Boyd, SIR JOHN ALEXANDER (1837–1916), Canadian jurist, was born in Toronto. He was graduated from Toronto University (1860), and was admitted to the bar (1863). In 1881 he was appointed chancellor of Ontario, and in 1887 president of the high court of justice for Ontario. He acted as arbitrator for the Dominion Government (1888) in claims against it by the Canadian Pacific Railway; for Ontario (1893) in settlements of accounts between the Dominion and the provinces; and for the Canadian Pacific Railway (1902) in difficulties with its trackmen. He has served on various royal commissions, and as director of several public institutions. He was made honorary LL.D. in 1889, and knighted in 1901. He has published *A Summary of Canadian History* (1856).

Boyd, JAMES (1888–), American author, was born in Dauphin County, Pa. He was educated at Princeton University and at Trinity College, Cambridge, and served with the American Expeditionary Force in France during the Great War. He holds high rank among the younger generation of American writers, his work showing evidence of careful research. His published works include *Drums* (1925), *Marching On* (1927).

Boy'den, SETH (1785–1870), American inventor, was born in Foxboro, Mass. He invented a machine for splitting leather (before 1815); introduced the manufacture of patent leather into America (1818); discovered the process of making malleable cast iron (1826); and improved the machinery for making hat bodies. He also constructed locomotives with the driving rod attached to the wheel, the 'link motion' of reversal, the 'cut off,' and double valve gear. He published *Correspondence on the Subject of Atmospheric Electricity* (1868).

Boyen, bō'yen, HERMAN VON (1771–1848), Prussian field marshal, was born in Kreuzburg, East Prussia. He entered the government service (1809); was director of the War Department and confidential adviser of the king (1810–12), and later Minister of War. He early advocated the substitution of general military duty for the existing militia system, and the statute making military service compulsory (1814) was carried into effect during his ministry. After a period of retirement he acted as general of infantry (1840–41), and was a second time Minister of War (1841–7), retiring with the rank of field marshal.

Boyer, bwȧ-yā', ALEXIS, BARON DE (1757–1833), French surgeon, was called to the chair of operative medicine in the Ecole de Santé, Paris (1792), and appointed second surgeon in the Hotel Dieu (1794). In 1805 he became premier surgeon to Napoleon whom he accompanied on many of his campaigns. After the Restoration he was appointed consulting surgeon to Louis XVIII., a post which he held under the two succeeding monarchs. He published two standard works, *Traité complet d'anatomie* (1797–9); *Traité des maladies chirurgicales* (11 vols., 1814–26).

Boyer, JEAN PIERRE (1776–1850), mulatto general and president of the republic of Haiti, was born in Port-au-Prince. He received a good education and joined the military service, taking part in the revolution of 1793, and in the internal wars that followed. He joined Pétion and Christophe in overthrowing Dessalines (q.v.); and on the death of Pétion, in 1818, was elected president, and soon ruled over the whole island. In 1825 he obtained recognition of the republic from France. His cruel, despotic administration eventually stirred up an insurrection, and in 1843 he was forced to flee to Jamaica and later to France, where he died.

Boy'ertown, borough, Pennsylvania, in Berks County, on the Philadelphia and Reading Railroad; 37 miles northwest of Philadelphia. Manufactures include iron goods, machinery, gas ranges, automobiles, cigars, and caskets. Pop. (1910) 2,433; (1920) 3,189.

Boyesen, boi'*e*-sen, HJALMAR HJORTH (1848–95), American author and educator, was born in Fredericsvaern, Norway. He was graduated from the University of Norway and went to the United States in 1868, settling in Chicago, where he edited a Scandinavian paper entitled *Fremad.* He was professor of German at Cornell University from 1874 to 1880, and at Columbia University from 1880 until his death. He was active in the literary life of New York, lectured on literary topics, and was a founder of the Authors' Club. His published works include: *Gunnar, a Norse Romance* (1874); *Falconberg* (1878); *Goethe and Schiller* (1878); *Ilka on the Hilltop* (1881; dramatized in 1884); *Idyls of Norway* (poems, 1882); *A Daughter of the Philistines* (1883); *Social Stragglers* (1884); *Story of Norway* (1886); *The Golden Calf* (1892); *Essays on German Literature* (1892).

Boyle, town, Ireland, in County Roscommon, on the River Boyle; 24 miles southeast of Sligo. The town grew up round a Cistercian abbey founded in 1161. It has trade in grain and butter. Pop. 2,700.

Boyle, EARLS OF ORRERY. See ORRERY.

Boyle, RICHARD, EARL OF CORK. See CORK, EARL OF.

Boyle, ROBERT (1627–91), English physicist and chemist, the seventh son of the first Earl of Cork, was born in Lismore Castle, Ireland. He lived successively in Stalbridge in Dorsetshire, Oxford (1654–68), and London. Devoting himself to chemistry, in 1660, he published, *New Experiments, Physico-Mechanical*—in an appendix to the second edition of which (1662) he enunciated and roughly proved the statement, now known as *Boyle's Law*, that 'the volume of a given mass of gas is inversely proportional to its pressure' (see GASES, LAWS OF). He was closely connected with the Royal Society; was identified with many philanthropic works; and founded the 'Boyle Lectures' (q.v.). His complete works (with his correspondence and a *Life* by Dr. Birch) were published in 1744.

Boyle Lectures, a series of lectures instituted by Robert Boyle (q.v.) and delivered annually at St. Mary-le-Bow Church, London, 'to prove the truth of the Christian religion against atheists, deists, pagans, Jews, and Mohammedans, not descending to any controversies among Christians themselves.' The first series of lectures were given by Richard Bentley in 1692. The published lectures comprise more than 200 volumes.

Boyle's Fum'ing Liq'uor, a mixture of ammonium polysulphides obtained by distilling a mixture of slaked lime, sal ammoniac, and sulphur.

Boyle's Law. See GASES, LAWS OF.

Boyne, boin, an important river of Ireland, rises near the village of Carbery, Kildare, on the borders of King's County. It flows through Meath in a northeasterly direction, passing Trim, Navan, and Slane; separates Meath from Louth; and enters the Irish Sea a little below Drogheda, after a course of about 70 miles. It is navigable for vessels of 250 tons to Drogheda, and for barges to Navan.

At the *Battle of the Boyne,* fought on its banks, 3 miles west of Drogheda, on July 12, 1690 (July 1 O. S.), William III. with 40,000 men defeated James II. with an ill-equipped army of 26,000. The Orange Duke of Schomberg (q.v.) was shot dead and James fled from the field to France. The outcome of the battle decided the fate of the Stuart cause and assured the Protestant cause in England.

Boyne, Battle of the. See BOYNE.

Boyne City, city, Michigan, in Charlevoix County, at the mouth of the Boyne River, and on the Boyne City, Gaylord, and Alpena Railroad; 180 miles by rail north of Grand Rapids. There are foundries, repair shops, and boat building plants. It is also a popular summer resort. Pop. (1910) 5,218; (1920) 4,284.

Boys' Brigade, THE, a movement set on foot in 1883 by Sir

W. A. Smith of Glasgow, Scotland, its object being 'the advancement of Christ's kingdom among boys, and the promotion of habits of obedience, reverence, discipline, self-respect, and all that tends toward a true Christian manliness.' The boys are formed into companies in connection with churches, missions, and Sunday schools, their ages varying between twelve and seventeen years. They adopt a simple uniform of cap, belt, and haversack, in addition to their ordinary clothes; and they are trained by military drill and discipline. The organization is also established in the British colonies and the United States. Its total strength is about 70,000 officers and boys.

Boy Scouts, an organization of boys and youth between the ages of twelve and eighteen years and upward, which aims to develop character, to aid in furnishing equipment for a career, and to train in service for others, physical health, and efficient citizenship, by utilizing the natural activities and interests of the adolescent period.

The development of the boy scout movement in England is due to Lieut.-Gen. Sir Robert S. S. Baden-Powell (q.v.), who, during the siege of Mafeking (1899), had seen the boys, under Lord Edward Cecil's command, organized and drilled into an efficient messenger service. When Baden-Powell returned to England, in 1902, the idea was fostered and received popular support, and a general plan of organization was adopted. The first boy scouts organization was formed in 1908, and a Royal Charter of Incorporation was granted in 1910, the organization being recognized as a 'non-military, public service body.'

In the ***United States*** Daniel Carter Beard, with his 'Sons of Daniel Boone,' Ernest Thompson Seton (q.v.), with the 'Woodcraft Indians' (1902), and others had much to do with the early success of the movement, their ideas, in conjunction with those of Sir Robert, forming the basis of the Boy Scouts of America. This organization was incorporated under the laws of the District of Columbia on Feb. 8, 1910.

The *Boy Scouts of America* is non-military and interdenominational in character, the movement being supported by Catholics, Protestants, and Jews alike. Of late it has also been given consideration as an educational adjunct by well known educators: some schools adopting the scout programme in part or as a whole, while a number of universities and colleges conduct special courses for scoutmasters and scout officials.

The administration of the Boy Scouts of America is in the hands of a National Council, working through an Executive Board. The Council includes many men of national prominence, and has the President of the United States as honorary president, and the former Presidents of the United States as honorary vice presidents. The National Scout Commissioner is Daniel C. Beard. The National Headquarters is at 200 Fifth Avenue, New York City, where are issued the official publications, including the *Handbook for Boys, Handbook for Scoutmasters, Boys' Life*, the official Boy Scouts' magazine, issued monthly, and *Scouting*, a semimonthly bulletin for scout officials.

Local councils are organized to supervise and extend the movement in communities, upon application by representative citizens to national headquarters. Such local councils work through an executive committee and a commissioner, with a paid executive when developments warrant.

The scouts themselves are organized into patrols of eight boys, three or four patrols forming a troop under a scoutmaster. Each troop has also a committee of three or five men, representing the organization with which it is connected, such as schools, churches, settlement houses, play grounds, etc. This committee recommends the selection of the scoutmaster to the local council, or to national headquarters direct where there is no local council, and coöperates with him. Any boy of twelve or older may become a scout upon fulfilling certain conditions. This includes taking the scout oath, which reads as follows: 'On my honor, I promise that I will do my best—(1) to do my duty to God and my country, and to obey the scout law; (2) to help other people at all times; (3) to keep myself physically strong, mentally awake, and morally straight.' He also subscribes to the twelve points of the Scout Law: a scout is trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, and reverent. The motto of the organization is 'Be Prepared'; and the principle, 'Do a Good Turn Daily,' is kept constantly before the boys.

Scouts are divided into three classes—tenderfoot, second-class, and first-class scouts. Promotion in these classes is conditioned on passing certain requirements, after which the goal is the attainment of merit badges given for special proficiency in such subjects as first aid, life saving, tracking, signalling, cycling, nature study, seamanship, campcraft, woodcraft, the handicrafts, and the like. In all, fifty-seven merit badges are provided. If a scout earns a certain five of these, he becomes a life scout; ten, a star scout; and twenty-one, an eagle scout, which is the highest degree in scoutcraft. Special honor medals in bronze, silver, and gold are given for life saving.

A book department is maintained by the national organization, which, with the assistance of a library commission composed of expert book men, makes available reliable advice as to worthwhile books for boys, and, under the leadership of this department, arranges with publishers for reprint editions of a high grade of books for boys at prices which will compete with the trashy material found in the markets. The results of this department in the shape of definite lists, carefully subdivided, are made available without charge to librarians, local councils, troops, and parents of boys throughout the country. Many hundreds of parents have already been given special advice as to courses of reading for their boys.

In 1926, in Great Britain and the British colonies, there were 521,147 scouts and scoutmasters; and in the United States, 756,857. Scouting is established in nearly every country of continental Europe, with a total membership numbering approximately 1,700,000.

In August, 1926, the fourth biennial International Conference of Boy Scouts was held in Kandersteg, Switzerland. Delegates from 32 nations were present.

Boy'ton, Paul (1848–), natatory expert, was born in Dublin, Ireland. As a youth he went to the United States, and served during the Civil War. He became a submarine diver, and invented an inflated rubber suit for swimming long distances. One of his journeys was from the mouth of Cedar Creek, Mont., to St. Louis, Mo., a distance of 3,580 miles. His plunge from a vessel 40 miles off the Irish coast, in a furious storm, and his crossing of the English Channel in twenty-four hours (1875) were noteworthy. He wrote *Roughing It in Rubber* (1886).

Bozeman, boz'man, city, Montana, county seat of Gallatin County, on the Northern Pacific and the Chicago, Milwaukee and St. Paul Railroads; 75 miles southeast of Butte. It is the seat of the State Agricultural and Mechanical College. There are manufactures of brick, lumber, and flour. A canal 20 miles long has been recently built for irrigation purposes and as a waterway. Pop. (1910) 5,107; (1920) 6,183.

Bozen, town and summer resort

in Tyrol, Austria, on the Etsch, 83 m. S. of Innsbruck; in the middle ages an important emporium in the trade between Venice and Central Europe, and still the chief commercial centre of Tyrol. It has as interesting church of the 14th and 15th centuries, and a monument to the poet Walther von der Vogelweide. The people grow fruit and wine, and manufacture cottons. Pop. (1900) 13,632.

Bozrah (mod. *El-Buseireh*), chief city of the Edomites, 25 m. S.E. of the Dead Sea, Palestine. It was a place of great antiquity (Gen. 36:33); it is now in ruins.

Bozzaris, Marcos (1788–1823), celebrated Greek patriot, 'the modern Leonidas,' was born at Suli in Epirus. From early youth he was in the midst of the struggle for Grecian independence. Defeated in 1803 by Ali Pasha, and compelled to retreat to the Ionian Isles, he afterward joined Ali in 1806, on the latter's revolt against the Sultan, and kept up the war after Ali's defeat and death at Yanina (1822). He died near Missolonghi, which he had long defended, in the course of a daring night attack on the Turkish army in August, 1823.

Bra, tn., prov. Cuneo, Italy, 31 m. by rail S.E. of Turin; breeds silkworms, and trades in wine, truffles, and silk. Pop. (1901) 15,821.

Brabançonne, La, the national song of Belgium, composed and sung during the revolution in 1830. The words were by Jenneval—*i.e.* Dechet (1801–30)—a French actor, an active revolutionist, killed fighting near Antwerp in October, 1830. The music was composed by François van Campenhout (1779–1848).

Brabant. (1.) South Brabant, prov. of Belgium, in the middle of the kingdom, between the Meuse and the Scheldt. It is flat, fertile, and the most densely inhabited province of Belgium (998 inhabitants to the sq. m.). Both agriculture and manufacturing industries flourish — the latter producing lace, linen, cloth, carpets, hats, spirits, tobacco, starch, paper, chemicals, beer, machinery, leather, pottery, and soap. Area, 1,267 sq. m. Pop. (1900) 1,263,807. Chief town, Brussels. (2.) North Brabant, prov. in S. of Holland, to the E. of Zeeland; very level, marshy, and generally unfertile. Area, 1,980 sq. m. Pop. (1899) 553,842. Cap. s'Hertogenbosch (Bois-le-Duc).

Brac, Dalmatia. See Brazza.

Bracara Augusta, Portugal. See Braga.

Bracciano, tn., prov. Rome, Italy, 27 m. N.W. of Rome, on the S. side of the Lake of Bracciano. Its principal feature is the vast baronial castle, built by one of the Orsini in 1480, and since 1696 a possession of the Odescalchi. Pop. (1901) 3,560.—The Lake of Bracciano, known to the ancients as *Lacus Sabatinus*, fills an extinct crater, and lies 540 ft. above sea-level, but has a depth of over 800 ft., or 260 ft. *below* sea-level. It measures about 20 m. in circumference, and has been famous for its fish since Roman times.

Braccio, or Fortebraccio, whose real name was Andrea da Montone (1368–1424), Italian *condottiere*, or captain of mercenaries, prince of Perugia and lord of Capua, was born at Perugia. Banished from Perugia in 1400, he aided, in 1408, Ladislaus, king of Naples, in taking the city, of which, on the death of Ladislaus, he assumed (1416) control. In 1416 he made himself master of Rome for a period of over two months (June–August). In 1421 he espoused the cause of Joanna II. of Naples, surprised Capua, and entered Naples in triumph. His ambition awakened the suspicion of Joanna, who joined Anjou and Sforza against him. At the siege of Aquila Braccio was wounded, and died three days afterward of voluntary starvation, from chagrin at his defeat.

Bracciolini, Francesco (1566–1645), Italian poet, born at Pistoja, enjoyed the patronage of Cardinal Maffeo Barberini, who became Pope Urban VIII. He produced an imitation of Tasso, much admired in its time, in the *Croce Riacquistata* (1605–11), which narrates in thirty-five cantos the war waged by the Emperor Heraclius against the king of Persia for the recovery of the cross. In the burlesque poem, *Lo Scherno degli Dei* (1618–26), the ancient gods are parodied after the manner of Tassoni. See G. Cegani, *F. B. eil suo Poema*, in *Ateneo Veneto* (1883, vol. ii.); M. Menghini, preface to our poet's *Psiche* (1889); and Barbi, *Notizia della Vita e delle Opere de F. Bracciolini* (1897).

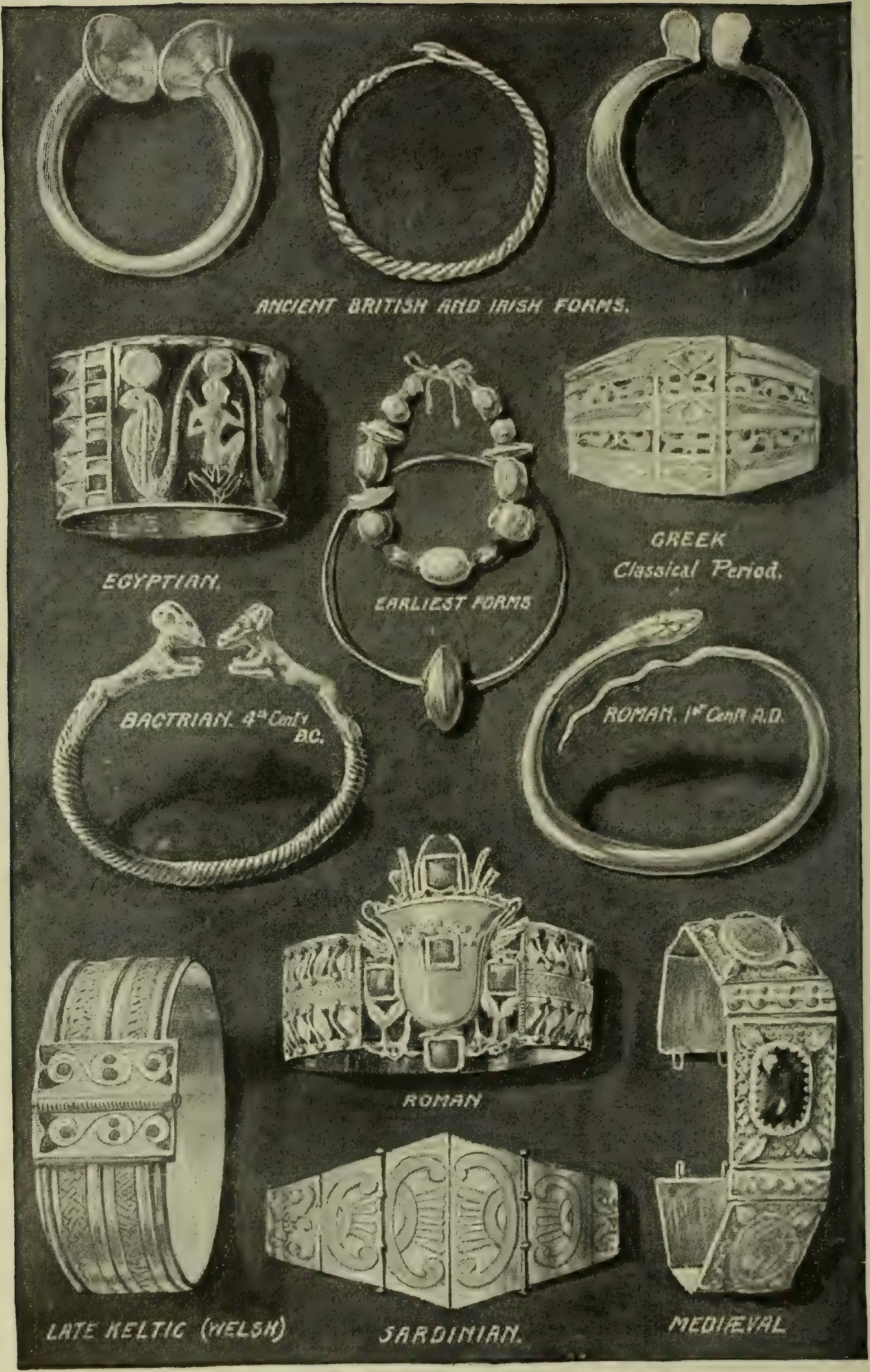
Brace, Charles Loring (1826–90), American philanthropist and author, born at Litchfield, Conn., and graduated at Yale, where he also studied theology. After extensive travels in Europe he settled (1852) in New York, and devoted himself to ameliorating the condition of the lowest classes by founding the New York Children's Aid Society and other organizations. His most important publications are *Hungary in 1851* (1852); *Home Life in Germany* (1853); *Norse Folks* (1857); *Races of the Old World* (1863); *The New West, or California in* 1867–8 (1868); *The Dangerous Classes of New York* (1872); *Gesta Christi* (1883); *The Unknown God* (1889). See *Life* by his daughter (1894).

Bracebridge, tn., Muskoka co., Ont., Canada, 98 m. N. of Toronto, on the Muskoka R. and on the Grand Trunk R. R. It is the chief settlement of the surrounding lake region and is in high favor as a summer resort. There are manufactures of lumber, flour, woollens, etc. Pop. (1901) 2,479.

Bracegirdle, Anne (?1663–1748), English actress, made her début in *The Orphan* at the Duke's Theatre in Dorset Garden, London, and from 1693 appeared at the Theatre Royal as Lucia in Shadwell's *Squire of Alsatia* (1688), and with Betterton at the Lincoln's Inn Theatre as Angelina in Congreve's *Love for Love* (1695); she created Belinda in Vanbrugh's *Provoked Wife*, and Almeria in Congreve's *Mourning Bride*. She was at home in tragedy as well as in comedy, and her professional career was a long series of triumphs until she retired from the stage in 1707, eclipsed by Mrs. Oldfield. See Baker's *English Actors* (1879), Cibber's *Apology* (1822), and W. Clark Russell's *Representative Actors* (1875).

Bracelet. An ornamental band worn on the arm or wrist. In the stricter sense, bracelets or armlets are of various types:—(1.) Prehistoric bracelets (*armillæ*) of gold and bronze, both penannular, and with trumpet-shaped ends, the gold generally plain, the bronze most frequently richly decorated with zoomorphic designs, and sometimes set with enamels. Some of the latter were also arranged as a coil down the arm. (2.) The Norse or Viking type, which consisted of large bracelets of finely-twisted silver terminating in knobs or in hooks. A special variety of bracelets of bronze is the massive armlet of 'late-Celtic' type peculiar to Scotland, an enrichment of the coiled serpent variety. Bracelets of chain-work were worn by Hebrew women. Enamelled bracelets of various metals prevailed in Egypt. In the regalia of the Mogul emperors of India was a unique pair of bracelets set with diamonds of unrivalled beauty and costliness. Bracelets were worn by both men and women among the ancient Germanic tribes and among the Romans, and were bestowed upon distinguished warriors and others as a mark of honor. But since about the end of the 12th century the wearing of bracelets has been chiefly confined to women. Horn and mother-of-pearl, besides copper and brass, have been used for bracelets; and in Anglo-Saxon tombs bracelets have been found made of beads of vitreous paste strung together.

Brachial Artery, the artery carrying the blood to the arm. It

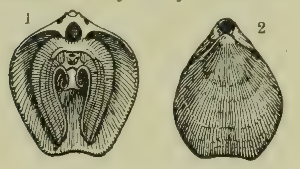


ANCIENT TYPES OF BRACELET.

is a prolongation of the axillary artery. It begins at about the lower border of the armpit, and ends by dividing into the radial and ulnar arteries just below the bend of the elbow, lying, in its upper part, in a position corresponding to that of the inner seam of a sleeve, and gradually sweeping outward to the front of the elbow joint. When hæmorrhage occurs below the armpit, and cannot be stopped by direct pressure on the bleeding spot, forcible pressure should be applied on the line of the inner seam of the sleeve, high up on the arm; this compresses the brachial artery against the bone (humerus). This vessel gives off several branches before dividing below the elbow.

Brachial Plexus, the network of nerves which supply the arm. It is formed by the four lower cervical nerves and part of the first dorsal, and lies between the root of the neck and the axilla or armpit, where it breaks up into several branches.

Brachiopoda, brak-i-op′ō-d*a or* brak-i-ō-pō′d*a* ('arm-footed'), or LAMP-SHELLS, an interesting group of animals which, owing to the presence of two calcareous shells, have sometimes been included in the group Mollusca, but which are now placed in proximity to the Polyzoa or Bryozoa, which they resemble in many points. They vary from less than half an inch to 1 or rarely 2 inches in length and externally resemble the ordinary bivalve. The shells, however, lie dorsally and ventrally instead of right and left. The ventral valve is in many cases provided with hinge teeth, which fit into depressions in the upper valve and lock the two halves firmly together. The body proper lies towards the hinge, and the large space between the two mantles is occupied by two long tubes, bearing on one side movable cirri, and varying greatly in their degree of freedom and manner of twisting. They are tentacular, or labial organs, and arise from the outpulled margins of the mouth.



Brachiopoda

1. With one shell removed. 2. Entire.

The adult Brachiopods are excessively passive organisms. Some are fixed by whole or part of their ventral valves, others seem to have been anchored in the mud by long spines, while a few are stalked either for life or in their earlier stages. The food seems largely to consist of diatoms, but the Lingulidæ are also known to sweep in small crustaceans and abundance of mud. They are all marine, and attach themselves to rocks, corals, molluscs, etc.

Brachiopods flourished from the Cambrian to the Carboniferous era, then decreased in numbers during the Permian and Triassic periods, and again became comparatively abundant in the Jurassic and Cretaceous seas. There are about 100 species existing at the present time.

Brachycephalic. See SKULL.

Brachyura, brak-i-ū′r*a* ('short tails'), a name given to those decapod crustaceans in which the tail is short and bent beneath the body—*e.g.* the common edible crab. See DECAPODA and CRAB.

Bracken. See BRAKE.

Brack′enridge, borough, Pennsylvania, Allegheny county, on the Allegheny River, and the Pennsylvania Railroad; 23 miles northeast of Pittsburgh. Coal, natural gas and oil are found, and glass and steel are manufactured. Pop. (1910) 3,134; (1920) 4,987.

Brackenridge, HENRY MARIE (1786–1871), American lawyer and author, son of H. H. Brackenridge, was born in Pittsburgh, Pa. He was admitted to the bar in 1806, was appointed a district judge in Louisiana in 1812, and was United States judge for the western district of Florida from 1821 to 1832, serving also on diplomatic missions to Mexico and South America. He wrote a *History of the Late War between the United States and Great Britain* (about 1816), and *Recollections of Persons and Places in the West* (1834).

Brackenridge, HUGH HENRY (1748–1816), American lawyer and author, was born near Campbelton, Scotland. He was brought as a child to York county, Pa. (1753), and worked his way through Princeton where he held a position as tutor while studying for the ministry. He taught school in Maryland for several years, and in 1776 removed to Philadelphia, where he edited the *United States Magazine.* He subsequently practised law at Pittsburgh and was a justice of the State Supreme Court from 1799 until his death. He wrote *Modern Chivalry; or the Adventures of Captain Farrago* (1796–1806), and *The Battle of Bunker Hill,* a drama (1776). He composed, with Philip Freneau, a poetical dialogue, *The Rising Glory of America* (1772).

Brack′ett, CYRUS FOGG (1833–1915), American educator, was born in Parsonfield, Me. He received the degree of A.B. from Bowdoin College in 1859, and of M.D. in 1863 (LL.D., 1892; Lafayette, 1883). He was instructor in chemistry in Bowdoin in 1863 and professor from 1864 to 1873, when he became professor of physics in Princeton.

Brac′ton, or BRATTON, HENRICUS DE (d. *c.* 1268), English ecclesiastic and judge, was born in Devon or Somerset. He was archdeacon (1264–5) of Barnstaple and chancellor of Exeter Cathedral, where he lies buried. He was also one of the royal judges (1245) who went on circuit in the later years of the reign of Henry III. His comprehensive treatise, *De Legibus et Consuetudinibus Angliæ,* one of the greatest of European mediæval law books, was written just as the victory of the royal courts over their rivals, the feudal and the local courts, was being completed. Bracton did much to bring about the victory, and to establish one 'common law' for the whole of England. Two editions of the book were printed, in 1569 and 1640. See also Sir Travers Twiss' edition (Rolls Series, 1878–83); Professor Maitland's edition of the *Notebook* (1887), and his admirable account of Bracton (Selden Series).

Brad′dock, borough, Pennsylvania, Allegheny county, on the Monongahela River, and the Baltimore and Ohio, the Pennsylvania, the Pittsburgh and Lake Erie, and the Union Railroads; 10 miles southeast of Pittsburgh. It has the first Carnegie Library established in America and a hospital, and nearby is Kenneywood Park. The principal manufactures are iron and steel. Other products are cars, plaster, cement, and wire. According to the Federal Census for 1919, industrial establishments number 49, with products valued at $9,438,995. The locality was the scene of General Braddock's defeat, July 1755. Pop. (1900) 15,654; (1910) 19,357; (1920) 20,879.

Braddock, EDWARD (1695–1755), British soldier in America, was born in Perthshire, Scotland. He entered the British army in 1710, and in 1754 was made a major-general and was placed in command of the British regular and colonial forces in America, landing at Hampton, Va., in February, 1755. In pursuance of a campaign against the French, he started from Fort Cumberland for Fort Duquesne (now Pittsburgh) on June 10, 1755; on July 9 when about 10 miles from Fort Duquesne, on the banks of the Monongahela River, he was ambushed by Indians and French, and after displaying great bravery was mortally wounded and his army routed with great slaughter, Col. George Washington, one of the few officers who escaped unharmed, conducting the retreat. Of 86 officers, 63 were killed or wounded; of 1,370 soldiers, 914 were killed or wounded.

Brad'don, Mary E. (1837–1915), English novelist, was born in London. The Strand Theatre produced her comedietta, *Loves of Arcadia,* in 1860, and in 1861 she published a volume of verse entitled *Garibaldi, and Other Poems.* About this time, also, a young printer of Beverley commissioned her to write for his weekly newspaper her first novel, *The Trail of the Serpent,* originally published as *Three Times Dead. Lady Audley's Secret,* published in 1862, made her name as a novelist, and was followed by the equally popular *Aurora Floyd* (1863), *Eleanor's Victory* (1863), *Henry Dunbar* (1864), and numerous other works, bringing her total production to well over sixty novels. Her later works include: *Ishmael* (1884); *Wyllard's Weird* (1886); *London Pride* (1896); *Rough Justice* (1898); *The Conflict* (1903); *A Lost Eden* (1904); *Our Adversary* (1909); *The Green Curtain* (1911); *Miranda* (1913). Miss Braddon became the wife of Mr. John Maxwell, publisher, in 1874. Their son, William B. Maxwell, is a novelist of note.

Bra'dentown, city, Florida, county seat of Manatee county, on the Manatee River, and the Atlantic Coast Line, the East and West Coast, and the Seaboard Air Line Railroads; 45 miles southwest of Tampa. Pop. (1910) 1,886; (1920) 3,868.

Brad'ford, city, England, in West Riding, Yorkshire, on Bradford Beck, a tributary of the Aire and on the Leeds and Liverpool Canal; 9 miles west of Leeds. Notable buildings are the Town Hall in mediæval Gothic style; the Exchange; St. George's Hall; the Library; the Technical College; the Grammar School, founded in 1662; the Art Gallery and Museum; St. Peter's Church; and Cartwright Hall. Bradford is the centre of the worsted industry of Great Britain, all kinds of woollen fabrics being produced here. There are iron mines, engineering shops and collieries in the vicinity. The tramways, water works, and lighting system are owned and operated by the municipality. Thornton, 4 miles from Bradford, is the birthplace of the Brontës. Pop. (1921) 285,979.

Bradford, city, Pennsylvania, McKean county, on an affluent of the Allegheny River, and on the Buffalo, Rochester and Pittsburgh, the Erie, and the Pennsylvania Railroads; 140 miles northeast of Pittsburgh, and 3 miles from the Alleghany State Park (65,000 acres). The district is one of the richest in the country in petroleum and natural gas, the latter affording lighting and heating facilities. There are flourishing manufactures, including those of oil-well implements, gas engines, boilers, refined oil, chemicals, wood alcohol, glass, brick, and toys. According to the Federal Census for 1919 industrial establishments number 83, with $8,665,704 capital, and products valued at $10,861,158. Pop. (1900) 15,029; (1910) 14,544; (1920) 15,525.

Bradford, Amory Howe (1846–1911), American clergyman, was born in Granby, N. Y. He was graduated (1867) from Hamilton College, completing his theological studies at Andover, 1870. The same year he became pastor of the First Congregational Church at Montclair, N. J., and in 1901 was moderator of the National Council of Congregational Churches. Dr. Bradford was a founder and second president of the American Institute of Christian Philosophy, and took an active part in settlement work among the poor. He became an associate editor of *The Outlook,* and published many thoughtful volumes of a semi-religious, semi-literary character, including *Old Wine: New Bottles* (1892), *The Pilgrim in Old England* (1893), *The Age of Faith* (1901), *Spiritual Lessons from the Brownings* (1901), *My Brother* (1910), and *Preludes and Interludes* (1911).

Bradford, Gamaliel (1863–), American author, was born in Boston, Mass. He entered Harvard University in 1882, but was compelled to leave almost immediately on account of ill health. With the exception of some tutoring and lecturing he devoted his attention to literature after 1886. He wrote: *Types of American Character* (essays, 1895); *A Pageant of Life* (1904); *The Private Tutor* (1904); *Between Two Masters* (1906); *Matthew Porter* (1908); *Lee, the American* (1912); *Confederate Portraits* (1914); *Union Portraits* (1916); *A Naturalist of Souls* (1917); *Portraits of American Women* (1919); *A Prophet of Joy* (1920); *American Portraits* (1922); *Damaged Souls* (1923); *The Soul of Samuel Pepys* (1924).

Bradford, John (1510–55), English Protestant preacher and martyr, was born in Manchester. He was educated at Cambridge, converted to Protestantism by Latimer, and appointed (1553) royal chaplain to Edward vi., after whose death, for his fearless advocacy of the reformed faith, he was tried before Gardiner and Bonner, condemned as a heretic, and burned at Smithfield. He wrote many theological treatises, published in the collections of the Parker Society (1848–53).

Bradford, William (?1589–1657), one of the leaders of the 'Pilgrim Fathers,' was born in Austerfield, Eng. While still a young man he identified himself with the Separatists at Scrooby; in 1608 he accompanied them to Holland, and in 1620 he was one of the *Mayflower* emigrants. From 1621 until his death, except in 1633, 1634, 1636, 1638, and 1644, he was governor of the Plymouth Colony, and during this period rendered services of inestimable value to the colony. He wrote a *History of Plimouth Plantation,* which is indispensable to the student of the colony's history. Bradford's manuscript, after being long lost, was discovered in the library of the Bishop of London in 1855, and the book was first published in 1856, being republished several times subsequently. The manuscript was returned, with much ceremony, to Massachusetts in 1897; it is sometimes incorrectly called the 'Log of the *Mayflower.*' Consult Walker, *Ten New England Leaders.*

Bradford, William (1663–1752), the first printer in Pennsylvania, was born in Leicestershire, Eng. He emigrated to Pennsylvania in 1682; there in 1685 set up the first printing establishment in the Middle Colonies, and in 1693 removed to New York where he was the printer of the government for more than half a century. In 1725 he founded the *New York Gazette,* the first New York newspaper.

Bradford-on-Avon, market town, England, in Wiltshire, on the Avon, and on the Kennet and Avon Canal, 9 miles southeast of Bath. It has a unique little Saxon church of St. Lawrence, built by Aldhelm in the 8th century. The manufacture of kerseymere or cassimere in England is said to have originated here. Pop. (1921) 4,621.

Bra'ding, town, England, on the Isle of Wight, Hampshire. The ancient stocks and bull-baiting ring are preserved, and here are the ancestral home and burial chapel of the Oglanders, a family who came over with William the Conqueror. Pop. about 1,500.

Bradlaugh, Charles (1833–91), social and political reformer, was born in London. From an early date he was a strong advocate of the secularist and advanced radical causes, writing and lecturing under the name of 'Iconoclast'; and he took a prominent part in all popular movements. His organ, *The National Reformer* (1862), was the subject of a futile government prosecution, which led to the repeal of statutes still fettering the liberty of the press. In 1872 he published *The Impeachment of the House of Brunswick* (7th ed. 1880), and in 1873 he lectured in the United States and the British colonies. In 1876 the republication by Bradlaugh and Mrs. Annie Besant of *The Fruits.*

of Philosophy, which advocated the restriction of progeny, led to a sentence of six months' imprisonment and a fine of £200; but the sentence was reversed on appeal. In 1880 Bradlaugh became M.P. for Northampton, and a struggle ensued with the House of Commons on the question of the parliamentary oath, which Bradlaugh, an atheist by conviction, refused to take. Afterward he offered to take it (avowedly as a mere form) or to affirm, but the House would not allow him to do either. He was re-elected in 1881, 1882, and 1884, but was still excluded from his seat. Once more elected for Northampton in 1885, he was at length permitted to take the oath and his seat in January, 1886. Bradlaugh died on January 30, 1891, three days after the House of Commons had expunged the resolution passed against him in 1880. See Bradlaugh's *Autobiography* (1873); the *Biography of Charles Bradlaugh*, by A. S. Headingley (1880); *Life of Bradlaugh*, by C. R. Mackay (1888), and G. Bonner (1895).

Bradley, George Granville (1821–1903), dean of Westminster from 1881 to 1902, was a pupil of Dr. Arnold at Rugby, and a student at University College, Oxford, under Dean Stanley. He was assistant master at Rugby from 1846, and in 1858 was appointed headmaster of Marlborough College. In 1870 he left Marlborough to become master of University College, Oxford; and in 1881 he succeeded Stanley as dean of Westminster, which office he resigned in 1902. He published a revised edition of Arnold's *Introduction to Latin Prose* (1884), *Recollections of A. P. Stanley* (1883), *Aids to Writing Latin Prose Composition* (1884), and, with Mr. R. E. Prothero, *Life of Dean Stanley* (1893).

Bradley, Henry (1845), English lexicographer, was born in Manchester, and became a clerk and foreign correspondent in a commercial house in Sheffield. In 1884 he went to London, and contributed to the leading literary journals, and was twice (1891–3 and 1900–1) elected president of the Philological Society. Since 1889 he has been joint-editor with Dr. Murray of the *New English Dictionary* (Oxford). He is the author of *The Story of the Goths* (1888), and has edited numerous English texts, notably Caxton's *Dialogues* (1900), for the Early English Text Society.

Bradley, James (1693–1762), English astronomer. His chief astronomical researches were conducted from the beginning at Wanstead in Essex. In 1721 he was appointed to the Savilian chair of astronomy at Oxford, and in 1729 lecturer on experimental philosophy; and in 1742 succeeded Halley as astronomer-royal. Bradley's reputation rests on his accuracy as an observer; his discovery of the 'aberration of light,' by which he accounted for the apparent displacement of the fixed stars; and his discovery of the nutation of the earth's axis, due to the moon's unequal action on the equatorial parts. These discoveries, by making exact knowledge of the position of the fixed stars possible, laid the foundation of modern observational astronomy. See Rigaud's *Memoirs* in his edition of Bradley's *Miscellaneous Works* (1832).

Bradley, Joseph P. (1813–92), American jurist, was born at Berne, near Albany, N. Y., worked on his father's farm, taught school, and graduated (1836) at Rutgers College. He was admitted to the bar at Newark, N. J., 1839, and was counsel for the New Jersey Railroad, and prominent in many leading cases, from that time until his appointment to an associate-justiceship of the U. S. Supreme Court in 1870, being assigned to the fifth circuit, including the Gulf States from Georgia to Texas. His opinions in railroad and other cases settled many open questions. He was a member of the electoral commission (1876), and gave the casting vote in favor of Hayes.

Bradley, William O'Connell (1847), American legislator, born in Garrard, Ky.; was admitted to the bar in 1865; elected prosecuting attorney in 1870; presidential elector in 1872; several times defeated for Congress; delegate-at-large to six Rep. National conventions; four times defeated for U. S. Senator; appointed minister to Korea, but declined, in 1889; first Rep. governor of Ky., in 1895–9; elected U. S. Senator (Rep.) for the term of 1909–15.

Bradshaw, George (1801–53), originator of railway guides, began life as an engraver in Manchester, England (1821). In 1839 appeared *Bradshaw's Railway Time-tables*, enlarged and changed next year to *Bradshaw's Railway Companion*. The monthly *Railway Guide* dates from December, 1841. His other publications include the *Continental Railway Guide* (begun Paris, 1847), and the *Railway Directory and Shareholder's Guide* (1849).

Bradshaw, Henry (1831–86), English scholar, antiquary, and librarian, was born in London, and educated at Eton and Cambridge. As assistant in the Cambridge University library he unearthed the MS. of the famous *Book of Deer*, and rediscovered the Vaudois MSS. (1862), containing the earliest remains of the Waldensian language and literature. In 1863 he assisted in the exposure of Simonides, the forger of the Codex Sinaiticus, discovered by Tischendorf in 1859. He also brought to light (1866) two previously unknown works ascribed to Barbour, *The Siege of Troy* and *Lives of the Saints*. His *Collected Papers* were published in 1889, a *Memoir* by G. W. Prothero having appeared in 1888.

Bradshaw, John (1602–59), English regicide, son of a well-to-do country gentleman in Cheshire, was judge of the sheriff's court in London (1643–9) and chief-justice of Chester from 1647, but was comparatively unknown when called upon to preside over the commission for the trial of King Charles (1649), where he is accused of acting with undue harshness. President of the Council of State from 1649 until its dissolution by Cromwell in 1653, he was a strong opponent of Cromwell's later policy. Under Richard Cromwell he was again president of the Council of State. After the Restoration (1661) his body was dug up, hanged at Tyburn, and decapitated.

Bradstreet, Anne (*c.* 1612–72), known as 'The Tenth Muse,' and the daughter of Gov. Thomas Dudley of Mass., was born probably at Northampton, England, and sailed for America with her husband, Simon Bradstreet, it is thought, in Winthrop's company, 1631. Her husband (q.v.) became governor of the colony. Madame Bradstreet's poems were first published at London as *The Tenth Muse Lately sprung up in America* (1650), with introductory verses by Nathaniel Ward and others, and attracted attention as the first formal effort in verse coming from New England. See her *Works* (1867), edited by John H. Ellis.

Bradstreet, John (1711–74), an English soldier in America. He served as a captain in the Louisburg expedition of 1745, and as a lieutenant-colonel in the French and Indian War, being placed in command of Shirley's boatmen in 1756 and defeating a force of French under Coulon de Villiers near Oswego (July 3, 1756), taking part in the assault on Ticonderoga (July 8, 1758), and capturing Fort Frontenac (Aug. 27, 1758). In 1764, during Pontiac's conspiracy, as colonel, he led an expedition against the Indian tribes about Detroit, but wasted time in futile and unauthorized negotiations with the Indians, and in general showed his incapacity. On his return in Nov., a number of his men lost their lives in storms on Lake Erie and Lake Ontario. Parkman says of him, 'He was a man of more activity than judgment, self-willed, vain, and eager for notoriety.'

Bradstreet, SIMON (1603–97), American colonial governor, born at Horbling, Lincolnshire, Eng. He was educated at Emmanuel College, Cambridge, emigrated to the Massachusetts Bay Colony in 1630, settling at Cambridge, was sent to England as the agent of Mass. in 1662, was deputy-governor in 1678–9 and was governor in 1679–86 and 1689–92. His wife was Anne Bradstreet (q.v.), the poet.

Bradwardine, THOMAS (?1290–1349), Archbishop of Canterbury, and one of Edward III.'s chaplains, stlyed 'Doctor Profundus.' He was entered at Merton College, Oxford, and there delivered those lectures against Pelagianism afterward expanded into the treatise known as *De Causâ Dei contra Pelagium* (ed. 1618). Bradwardine was a strong opponent of the doctrine of works, and a stout upholder of the doctrine of free grace, which he regarded as inextricably bound up with the doctrine of God's foreknowledge. He was canon of Lincoln, chancellor of St. Paul's, and in 1349 was consecrated Archbishop of Canterbury, but died a few weeks later. See Milner's *Church Hist.*, vol. iv. pp. 79–106.

Brady, CYRUS TOWNSEND (1861), American author, was born at Allegheny, Pa., and graduated (1883) at Annapolis. He was obliged to abandon service in the navy, was ordained in the Episcopal Church (1890), was archdeacon of Kansas in 1892–95, when he was made first archdeacon of the Pennsylvania diocese, was rector of St. Paul's Church, Overbrook, Pa., in 1899–1902, resigned to devote himself to writing, became rector of Trinity Church, Toledo, O., in 1905. Of his publications, many are works of fiction dealing with adventure on the high seas. They include *For Love of Country* (1898), *Recollections of a Missionary in the Great West* (1900), *Stephen Decatur* (1900), *Sir Henry Morgan, Buccaneer* (1903), *A Little Traitor to the South* (1904), *The Two Captains* (1905), also a vol. of sermons, *The Love Test* (1908).

Brady, JAMES TOPHAM (1815–69), American lawyer, was born in New York city, and received his education, legal and otherwise, from his father, Thomas S. Brady, a leading member of the bar. Young Brady was admitted in 1836, and soon won prominence by securing the release of a young English girl who had been bound out by the N. Y. authorities. He was immensely successful as a jury lawyer in patent and criminal cases, and was counsel for Daniel E. Sickles, in his famous trial for the killing of Philip Barton Key. A states-right man before the Civil War, he supported the administration during that contest, on the platform. He wrote occasionally for the old N. Y. magazines.

Brady, JOHN (1840), Irish-American R. C. prelate, was born in Co. Cavan, Ireland, studied at the College of All Hallows, and was ordained a priest, 1864. He was assistant pastor at Newburyport, Mass., 1864–8, and in the latter year became pastor of St. Joseph's, Amesbury, Mass., preserving his connection with this parish after his appointment as auxiliary bishop of Boston, and his consecration as titular bishop of Alabanda, in 1891.

Bradycardia, an abnormal slowness of pulse, which may be either peculiar to the individual or due to disease, exhaustion, pain, poisoning, or other cause.

Bradypus. See SLOTH.

Braemar, vil. and dist. in pars. of Braemar and Crathie, S.W. Aberdeenshire, Scotland; the vil. Castleton of Braemar is 18 m. S.W. of the Ballater terminus of the Deeside Ry. The district is exceedingly picturesque, and contains several lofty peaks of the Cairngorm group. Balmoral Castle is close to Crathie. Pop. (1911) of Braemar and Crathie, 1,401.

Braga. (**1.**) Administrative dist. in the Portuguese prov. of Entre Minhoe e Douro. Area, 1,054 sq. m. Pop. (1900) 356,819. (**2.**) The ancient *Bracara Augusta*, tn. and archiepisc. see of Portugal, in the dist. of Braga, 33 m. N.N.E. of Oporto. It is a mediæval-looking place, still surrounded by walls, and has picturesque old houses, an imposing cathedral, large citadel, and archiepiscopal palace. It manufactures cutlery, firearms, and jewellery. Pop. (1900) 24,309.

Braganca. (**1.**) Administrative dist. in the Portuguese prov. of Traz-os-Montes. Area, 2,573 sq. m. Pop. (1900) 185,586. (**2.**) Town and seapt. Para, Brazil, 90 m. by rail E. of Belem. It is an agricultural centre. Pop. 18,000. (**3.**) Town, prov. São Paulo, Brazil, 50 m. by rail N. of São Paulo, with numerous sugar mills, and trade in pigs and cattle. Pop. 10,000.

Bragg, BRAXTON (1817–76), American Confederate general, born in Warren co., N. C. He graduated at West Point in 1837, was engaged in the Seminole War (1837–9), and served with distinction in the Mexican War (1846–8) under General Taylor, and in 1859 he retired from the army and became a planter in Louisiana. When the Civil War began, Bragg was made (1861) commander-in-chief of all the state troops in Louisiana. In February, 1862, he became a major-general, with his headquarters at Mobile, in command of the second division of the Confederate army, and he commanded the centre at the battle of Shiloh (April). He was next appointed (June, 1862) commander of the department of the Mississippi. In Aug., 1862, at the head of an army of about 45,000 men, he invaded Ky., but he was outmanœuvred by the Federal general Buell, and after the battle of Perryville (Oct. 8) withdrew into Tenn. He was repulsed by Rosecrans at Murfreesboro (Dec. 31, 1862, and Jan. 2, 1863); but in Sept., 1863, he defeated that general in the battle of Chickamauga, which proved a brilliant but barren victory for the Confederates. In Nov., 1863, he was decisively defeated by Grant at Chattanooga and in Dec. was relieved of his command. In 1864 he was called to Richmond, and appointed military adviser to Jefferson Davis, and in 1865 served under Gen. J. E. Johnston. His brother, THOMAS BRAGG (1810–72), was successively governor of N. Carolina (1855–9), U. S. senator (1859–61), and Confederate attorney-general (1861–3).

Bragi, or BRAGR, a famous minstrel in the ancient Norse sagas, sometimes called a son of Odin, and esteemed as a god. His name is identified with eloquence.

Braham, JOHN (b. 1774–1856), tenor singer, born in London of Jewish parents (his name was really Abraham), and made his début at Covent Garden in 1787. In 1796 he was engaged for Drury Lane, and next year for the Italian opera. After studying and singing in Italy and Austria, he reappeared at Covent Garden in 1801, and composed the music of his own part for several operas. His subsequent career was one of continuous success. He was the original Max in Weber's *Der Freischütz* (1824), and the original Sir Huon in *Oberon* (1826).

Brahé, TYCHO or TYGE (1546–1601), Danish astronomer, born at Knudstrup in S. Sweden (then a province of Denmark). An eclipse of the sun in 1560 directed his mind to astronomical study. In 1572 he discovered a new star in Cassiopeia. Down to this period he had resided mostly in Germany; but in 1576 Frederick II., the Danish king, helped him to build and equip in an exemplary way the observatory of Uraniborg, on the little island of Hven in the Sound, north of Copenhagen. There he labored until 1597, when intrigues compelled him to carry his instruments to Germany; and in 1599 he was invited to Prague by the Emperor Rudolph II. There Brahé had for a fellow-worker the famous Kepler, but died two years later. Tycho Brahé held that the planets moved round the sun, and the sun round the earth. This hybrid theory was expounded in the second volume of his *Astronomiæ Instauratæ Mechanica*, printed in 1598 (new ed. 1901). The first volume of the work, containing a dissertation on the star of 1572, was published by Kepler in 1602. Tycho Brahé first assigned to comets their position in interplanetary space. He discovered the variation and annual equation of the moon, investigated precession, and introduced a correction for refraction. His observatory of Uraniborg was excavated in 1901. See *Lives* by Gassendi (Latin, 1655) and Dreyer (1890).

Brahma, the creator of the universe, according to Brahmanism; the first person of the Trimurti, or trinity, of Hinduism. The Brahmans are his peculiar offspring, and the sole exponents of his will. See BRAHMANISM.

Brahmanas, those prose versions of the Vedas which describe the elaborate ritual to be observed by Brahmans (Hindu priests) in sacrifice and worship. The oldest is supposed to have been written about the 7th century B.C.

Brahmanbaria, munic. tn. in Tipperah dist., Bengal, India, 50 m. N.E. of Dacca. Pop. (1901) 19,915.

Brahmani, riv. in Chota Nagpur, Bengal, India; traverses Chota Nagpur and Orissa. It is famous in Hindu lore as the traditional scene of the love of the sage Parásara and the mother of Vyasa, reputed compiler of the *Vedas* and the *Mâhâbharata*.

Brahmanism or BRAHMINISM. The name given to the system which, persisting with remarkable continuity, connects modern Hinduism with the religion of the Vedas. Its essence is twofold, the inspiration and divine authority of the Vedas, and the irreversible superiority of the Brahmans to all other castes. The rise of Brahmanism was due to two causes: (*a*) the claim of the Brahmans (which was allowed) to ability to sacrifice more acceptably to the gods than any others, developing into the exclusive right of that caste to conduct the 'all-powerful sacrifice;' (*b*) this was founded on the other fact that as the language of the Vedas became obsolete, the Brahmans assumed the guardianship of the holy books, so that access to the gods was possessed by them alone. The caste system developed, separating the Brahmans from the Kshatriyas (warriors nobles), the Vaisyas (husbandmen), Sudras (laborers) and no-castes or outcasts. A mythical origin accounted for division into caste. This system riveted the fetters with which the Brahmans bound all India. Its dominance has continued to the present except during the 800 years when Buddhism was supreme (B.C. 300–A.D. 500). The audacity of the Brahman creed may be seen from the statement in the Satapatha Brahmana, 'The Brahman is the god of gods.'

A large part of the immense literature of India is from their hands. A most elaborate philosophy, absolutely fearless in its pursuit of reasoning, has been developed with a profound logical and metaphysical apparatus. Out of a gross polytheism there was developed the most thoroughgoing pantheism the world has known. And with it a trinity in the discussion of which every variety of doctrine ever proposed in connection with the Christian Trinity was anticipated over and over. The pre-Buddhistic domination of Brahmanism was won comparatively easily. A harder struggle came when Buddhism had become decadent and the Aryans were face to face with the host of religions in Southern India. The problem was solved by the double device of accepting the aboriginal doctrine of reincarnation, and of accounting for the existence of the gods of the South by the doctrine of Avatars, or the local appearance in historic form of a member of the trinity for reproof of evil or encouragement of good. Thus the Brahmans claimed to account for all forms of religion and claimed all religions as virtually their own. Frazer's *Literary History of India* (1899) is the best single work; see also Monier Williams's *Brahmanism and Hinduism* (1887), and *Indian Wisdom* (1893); Hopkins's *Religions of India* (1895), and the *Sacred Books of the East*, volumes dealing with Indian literature.

Brahmapurana. See PURANAS.

Brahmaputra (lit. 'son of Brahma or God'), one of the largest rivers of India. Its highest source, known as Tsangpo or Sanpo (Tibetan = 'river'), is in Lake Manasarowar, at the base of Kadas Hill, in W. Tibet, the altitude being between 15,000 and 16,000 ft. It flows E. for about 1,000 m. on the plateau of Tibet; then turning S.E. penetrates the Himalayas, under the name of Dihong, and descends to the valleys of Assam. There it assumes the name of Brahmaputra, flows in a S.W. and S. direction, and after partial confluence with the Ganges enters the Bay of Bengal in an expansive delta. Its length is about 1,800 m. During the rains the Brahmaputra floods and fertilizes hundreds of square miles of country. It is navigable for steamers to Dibrugarh, 800 m. from the sea. Here the discharge of the river at its lowest is said to be 116,115 cub. ft. per second.

Brahma Samaj ('the Society of God'). The most remarkable religious revival of modern times in India has been that of the Brahma Samaj. Its founder, Raja Ram Mohun Roy, born in 1774, had studied the philosophy of Hinduism at Benares and of Buddhism in Tibet. Denouncing *sati* and idol-worship, he sought to establish an eclectic system of practical morality. Although undoubtedly influenced by Christianity and Sufirite Islamism, it is important to note that the Hindu Unitarian Church which he founded (about 1830) was a return to a professedly ideal Brahmanism—the worship of a supreme deity, the essence of the universe. Raja Ram was born a Brahman, and died a Brahman. After his death the movement received a certain impetus (about 1842) as the Adi Samaj (New Church), under the leadership of one Debendra Nath Tagore; and Debendra Nath was followed by Keshub Chandra Sen (1838–84). Inspired by Sen's religious fervor and lofty eloquence, the Adi Samaj marked a distinct change of creed. In 1866 a breach took place, the Brahma Samaj was formed, the old society continuing as the Adi Brahma Samaj. God the Father was substituted for the Vedic definition of the Creator, and in the establishment of the 'brotherhood of man' the new church shook off all vestige of Brahmanism, and grew and prospered. A false step checked its career, and disappointed those who thought that they saw in this last development an approach of Hindu Unitarianism towards the theism of the West. Keshub Chandra Sen, who had repeatedly and strenuously opposed infant marriage, sanctioned the nuptials of his own daughter, at the age of fourteen, with the maharajah of Kuch Behar. In the succeeding disruption (1878) the mass of his congregation took refuge with the dissenters, the Sadharana (general) Brahma Samaj of the present day. In a conservative reaction this Samaj fell back on Vedic authority for the theism which it professes. Allied to this movement of religious thought in India are other forms of Vedic theisms, among which may be mentioned the Prasthana Samaj (Prayer Society) of Bombay, and the Arya Samaj (Aryan Society): the latter, however, is rather a political organization than a religious body. See Illingston's *Indian Theism* (1901); Keshub Chunder Sen, *Brahma Samaj* (1870); Miss Carpenter's *Memoirs of Ram Mohun Roy;* Miss Collet's

Historical Sketch of Brahma Samaj; *Sacred Books of East*, i., lxii. ff.; Bose's *Works of Rammohun Roy* (1888), Mozoomdar's *Life and Teachings of Keshub Chunder Sen* (1887), and Max Müller's *Ramakrishna* (1899).

Brahmin Ox. See ZEBU.

Brahms, JOHANNES (1833–97), an eminent composer and pianist, born at Hamburg. His musical education, begun by his father, was continued by Marxen of Altona. He began the study of composition at a very early age, was first known to the public as a pianist, and in 1853 was hailed by Schumann as a new and illustrious genius. Brahms settled in Vienna in 1861, and after some years concentrated his energies on composition. As his productions became known, it was acknowledged that he was one of the greatest composers of recent times. His music, however, appeals more to the musician than to the multitude. In the development of his ideas the serious purpose and lofty aim of his work preclude any pandering to mere ear-pleasing devices, and the superlative excellence of his compositions is only revealed to the trained intelligence of the cultured musician. Brahms wrote in practically every branch but the dramatic. His symphonies, overtures, and other orchestral compositions; his great choral-orchestral works, such as the *Deutsches Requiem* (op. 45), the *Song of Destiny* (op. 54), etc.; also his productions in the domain of chamber music in all its forms, take rank with the greatest creations in their several classes of composition. His concertos, Hungarian dances, etc., for piano, and his violin concerto (op. 77, written for Joachim), are works of conspicuous merit; while as a vocal composer in every form, and especially as a song-writer, Brahms occupies a position of almost unique distinction. As a pianist he showed great intellectual power. See Deiters, *Brahms, a Biographical Sketch* (1888); Dietrich and Widmann, *Recollections of Johannes Brahms* (1899); Mason, *From Grieg to Brahms* (1904).

Brahui. See BALUCHISTAN.

Braid, JAMES (?1795–1860), Scottish writer on hypnotism, was led to a scientific examination of this subject by La Fontaine's lectures in Manchester (1841), where he practised medicine most of his life. He demonstrated the subjective nature of the phenomena, and their independence of the alleged magnetic influence passing from the operator, and was the first to use the term 'hypnotism.' He wrote *Neurypnology, or the Rationale of Nervous Sleep, considered in Relation to Animal Magnetism* (1843); *Magic, Witchcraft, Animal Magnetism, Hypnotism, and Electrobiology* (3rd ed. 1852); and *Observations on Trance* (1850).

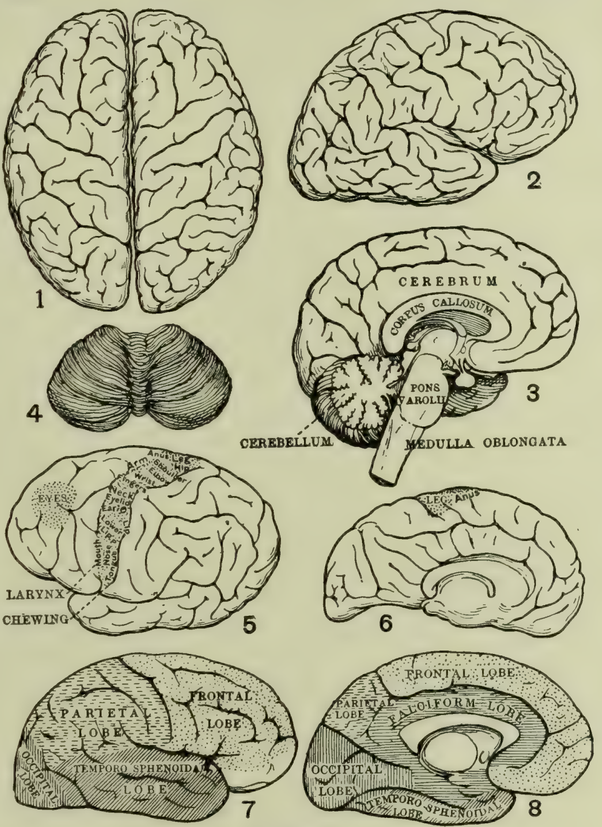
Braidwood, Thomas (1715–1806), was born in Scotland, and was a teacher of the deaf and dumb in Edinburgh. Encouraged by his success in teaching a pupil, Charles Sherriff, born deaf, and therefore mute, to speak (1760), Braidwood established his academy for teaching the mute, which was visited by Dr. Johnson. The academy was afterward removed to Hackney, London. See Johnson's *Works* (1806), ix. p. 337; Boswell's *Life of Johnson.*

Braila, tn., Roumania, 10½ m. above Galatz, on l. bk. of Danube, and on state line Galatz-Buseu. It exports wheat, tallow, meat, and wool. Before 1883 Braila was a free port. From the end of the 16th to the end of the 18th century it belonged to the Turks. Pop. (1899) 58,392.

Braille, Louis. See BLIND.

Brain, the organ of thought, sensation, and voluntary movement. It is protected by the skull, between which and the brain are delicate serous membranes (meninges) and a small quantity of fluid (the cerebro-spinal fluid), which acts as a water-bed, lessening the shock of any blow. The brain is divided by anatomists into four principal parts—the *cerebrum* (brain proper), the *cerebellum* (Lat. 'little brain'), *pons Varolii* ('bridge of Varolius'), and *medulla oblongata* (Lat. 'oblong marrow'). The cerebrum, or fore brain, is divided longitudinally into two cerebral hemispheres, the right and left by the great longitudinal fissure. This completely divides it, except where, towards the middle, the two halves are joined by a broad band of white substance (nerve fibres) called the *corpus callosum* (hard body). The surface of each cerebral hemisphere is divided (arbitrarily) by anatomists into four lobes, marked off from one another more or less plainly by fissures of various lengths and curves. These lobes and fissures are named and described in anatomical works for convenience in mapping out the brain, and locating the seats of its functions as far as possible. They have not precisely the same appearance in all brains, nor are the two sides exactly equal; and although useful to the surgeon as guides in operations, the fissures can only be considered very vague landmarks by the physiologist and the psychologist, our knowledge of the action of different parts of the brain being still comparatively rudimentary. Its minute anatomy must be looked for in the microscopical laboratory and in text-books. Broadly speaking, the cerebrum is made up of gray matter (cells which in groups form centres for thought, action, or sensation) and white matter (nerve strands acting as lines of communication). The surface of the cerebrum, in fact of the whole brain, is covered with gray matter—*i.e.* brain-cells, or centres—and owing to the arrangement of the surface in convolutions, the gray matter dips into the fissures and *sulci,* and so covers a larger area than it would were the brain uniformly smooth. Islands of gray matter are also embedded in the white. It is believed that brain power depends not altogether on the apparent size or the weight of the brain, but partly on the amount of convolution, which is much more marked on some brain surfaces than on others. Weight, however, seems to give a general index of brain power, and this argument is used by some when comparing the brain capacity of man and of woman—the average male brain weighing 49½ ounces, the average weight of the female brain being 44 ounces. Male brains range in weight generally between 46 and 53 ounces; female, between 41 and 47 ounces. Classical examples of heavy brains are Cuvier's (64 ounces) and Dr. Abercromby's (63 ounces). The weight of the brain should, however, be compared with the weight of the individual to whom it belonged. A big head does not necessarily mean a big brain, for that may arise from hydrocephaly. Below a certain size and weight we get microcephaly, and idiocy generally goes with these, though some remarkably powerful minds have accompanied exceptionally small heads (*e.g.* Shelley, Descartes, Foscolo, Donizetti, and Schumann). The cerebrum forms the largest part of the brain, and contains what are commonly spoken of as the 'higher centres'—*viz.* those for the higher or thinking faculties. This seems beyond question, although many higher centres cannot be exactly localized; and there are cases on record where a considerable quantity of cerebral brain substance has been injured or destroyed without any obvious psychical result. The whole brain is supplied with blood from the two internal carotid arteries and two vertebral arteries. There is also a circulation of lymph; each cell of gray matter lies bathed in lymph.

Functions of the Cerebrum.—From experiments made by Ferrier, Horsley, and others, those parts of the gray matter (cerebral cortex) concerned in certain actions have been mapped out roughly. The centres for movement of one side of the body lie on the opposite side of the brain. Thus, the right hand is guided by the left cerebral hemisphere. Motor areas—*i.e.* areas of the gray brain covering, apparently necessary for voluntary movement—have, until recently, been supposed to lie about the fissure of Rolando, on both sides of it; and the respective centres were roughly shown by taking a model of a brain and tracing the outline of a man's figure covering the fissure, head downward, looking backward, and with his arms and legs flexed. It has been stated by some observers that these motor areas lie entirely in front of the fissure of Rolando, and dip into the fissure, but do not cross it. These conclusions were reached by electrical experiments on the brains of anthropoid apes; but, at the same time, another investigator showed that the arrangement of fibres in the brain of a child agreed with these conclusions. The matter is still in dispute, the majority accepting the older statements. When an injury to the brain is followed by loss of voluntary movement, the mischief may lie either in the gray matter, or motor area, concerned in that movement, or it may be in the communication fibres, which normally carry the impulse from the motor centre to the part paralyzed. The brain is not bilaterally symmetrical (equal-sided) any more than is the skull, which shows curious asymmetry in many cases, when accurate measurements are taken.



The Brain.

1, Cerebrum from above, showing convolutions; 2, right hemisphere; 3, section through the centre of brain; 4, cerebellum; 5, 6, motor areas of brain; 7, 8, lobes of the right hemisphere, exterior and interior aspect.

Cerebellum.—The cerebellum, or little brain, lies under the after part of the cerebrum, and is connected with that and other parts of the brain by processes called *crura* (legs). Two join it to the cerebrum, two to the medulla oblongata, and two more form the pons Varolii. The cerebellum is divided into lateral hemispheres, with six lobes lying between. It is formed, like the cerebrum, of gray matter overlying white, with distinct masses of gray also in the interior. Disease of certain parts (lobes) of the cerebellum is believed to affect equilibration (balancing) and co-ordinated (controlled) movements. Some of the nerve fibres (white matter) are believed to be concerned in muscular sense (the sense of weight when exerting a group of muscles in lifting), but the function of the greater part of the cerebellum is unknown.

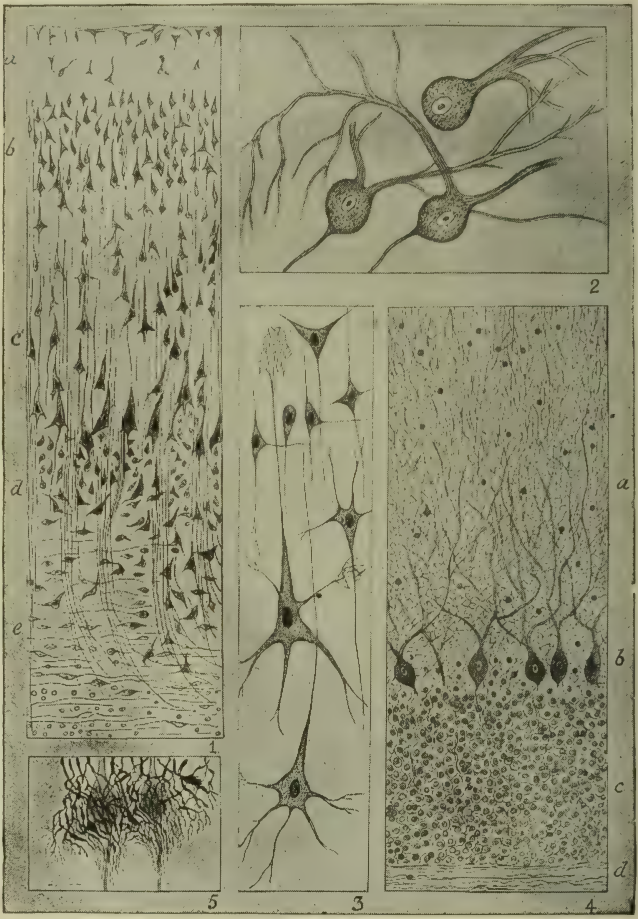
Pons Varolii.—The pons Varolii is made up mostly of bundles of nerve fibres joining the higher parts of the brain with the medulla. The cerebrum lies above it, the cerebellum behind it, and the medulla oblongata below.

Medulla Oblongata.—The medulla oblongata (sometimes called the spinal bulb) is the expanded upper end of the spinal cord. Of its nerve fibres, some run through the pons Varolii into the cerebrum, while others run directly into the cerebellum. It must be understood that all connections of the brain with the spinal cord pass through the medulla. In it there is also gray matter, which forms various collections of cells known as the vital centres. These work independently of the will, and govern respiration, the heart's action, the constriction of blood-vessels, swallowing, and secretion of saliva. The last six of the twelve pairs of cranial nerves (nerves emerging from the cranium or skull) arise in the medulla. When the medulla is cut all sensation is lost, because all impulse fails to reach the cerebrum. All voluntary movement is abolished, because the cerebrum cannot send down a message. Death immediately follows, because of interference with the impulses by which heart and lungs are kept in action. It is in the medulla that most of the nerve fibres cross; so that fibres which started on the right side of the brain reach the left side of the spinal cord, and those starting on the left go to the right.

The base of the brain, resting on the base of the skull, the floor of the cavity which holds the brain (or rather on the water-bed of cerebro-spinal fluid), gives off cranial nerves in twelve pairs, each cranial nerve arising from a spot on one half of the brain corresponding to that from which its fellow arises on the other half, and each being traceable to a similar centre; the centre, or directing cells of gray matter, being also in pairs—*i.e.* in corresponding positions in the cerebrum or cerebellum on either side of a longitudinal mesial line. Certain special centres (not for cranial nerves) are apparently single. Such is the speech centre, low down on the gray matter in the front of the left cerebral hemisphere. Any brain centre may conceivably be trained by use, enfeebled by disuse or insufficient use, excited by irritants, and paralyzed by a sufficient injury. Thus, one becomes expert in any movement through habit, and loses expertness for want of practice; and this not merely because of muscular incapacity, but because the impulse is not properly generated in the brain and transmitted by a nerve. Also, a nerve centre becomes irritated by a certain degree of pressure, and works independently of volition—as in epilepsy, started by the pressure of blood or broken bone on the brain surface. A greater degree of pressure from the same cause will produce, not movement, but immobility, followed, if the pressure reach vital centres, by insensibility and death. The sensory centres are not so well mapped out as the motor, for obvious reasons.

Development.—The brain at birth is heavy in proportion to the total body weight. It increases rapidly during the first seven years; more slowly from then until the age of about twenty; then more slowly still, until about forty. Soon after that age the weight begins to lessen very slowly. Sight and hearing are dormant at birth, and all the other senses are probably almost functionless.

Diseases.—Development may stop prematurely, and is followed by premature ossification of the cranial sutures, producing microcephaly. Hydrocephalus (water on the head), if severe, is also a cause of impaired development of the brain, and consequently of the faculties. Brain troubles in children occur chiefly through faults of development, or through the greater instability of the developing tissues. In old age, cerebral troubles arise from the weakness of degeneration, due in some cases to age alone, and in others to the gradual effect of chronic disease. The commonest of brain affections in old age arise from the loss of elasticity of vessel walls, and perhaps a roughening of their inner surface. Thereafter any increased blood pressure tends to rupture the walls and produce cerebral hæmorrhage; or a thrombus forming in the vessel, and blocking the circulation, may cut off the blood supply from a part of the brain, so that it ceases to work. 'A man is as old as his tissues,' and their age, for working purposes, is governed by the treatment which he has given them: one may suffer from the cerebral effects of old age before one has reached middle life. The commonest symptoms of disease of the unstable, developing brain are convulsions, often slight, and due merely to distant irritation (such as worms), or developing to the extent of true epilepsy. Inflammation of the brain coverings (meningitis) may be simple, or may arise from tubercle. Syphilis, tubercle, and alcohol are probably the commonest causes of cerebral degeneration; but it must not therefore be supposed that all cerebral mischief is either syphilitic, tubercular, or alcoholic. Physical violence producing hæmorrhage, or pressure of depressed bone, often starts brain symptoms. Gradually growing tumors, either of the brain substance, or arising from the inner table of the skull, will slowly disturb those parts of the brain on which they press, and first excite and then destroy their powers. The brain is remarkable as an organ both for its extreme delicacy and its great power of resistance and recuperation. A man may live with a bullet in or through his brain, and may die as the result of brain trouble the



Brain Cells.

1. From third cerebral convolution × 75:—*a*, Superficial layer with scattered cells; *b*, layer of small pyramidal cells; *c*, broader layer of pyramidal cells separated by radiating nerve fibres; *d*, narrow layer of small irregular cells; *e*, layer of fusiform cells in medullary centre. 2. Large cells from the gray cortical layer of the cerebellum × 230. 3. Ganglion cells of various sizes from the gray matter of the cerebral hemisphere. 4. Vertical section of the gray matter of the cerebellum × 75:—*a*, Superficial (molecular or fibrillar) layer; *b*, second layer = ganglion cells of Purkinje; *c*, nuclear layer; *d*, white substance. 5. Basket-work fibres round the cells of Purkinje.

originating cause of which cannot be detected by any known method; he may live after an iron bar has passed through the roof of his mouth and out at the crown of his head, yet he may die because of a minute clot of blood. See Ferrier's *The Functions of the Brain* (2nd ed. 1886); Horsley's *Structure and Functions of the Brain* (1892); Barker's *The Nervous System and Its Constituent Nerves* (1899); Obersteiner's *The Anatomy of the Central Nervous System* (trans. Hill, 1890); Luys's *The Brain and its Functions* ('International Science Series,' 1884); Quain's *Anatomy*, vol. iii. pt. 1 (10th ed. 1893).

Brainard, DAVID LEGGE (1856), American explorer, was born at Norway, Herkimer co., N. Y., and enlisted, 1872, in the U. S. army. He saw much Indian service in the West under Gen. Miles, and received his promotion as sergeant in 1879. He was detailed to accompany the Lady Franklin Bay expedition (1881–4), under Lieut. Greely, of which he was first sergeant, and in which he took a prominent and heroic part — with Lieut. Lockwood reaching the, at that time, farthest northern point (83° 24′ 30″ N. lat.) ever reached by an explorer. He was one of the seven survivors of the expedition rescued by Schley. For these and other services he was commissioned a 2nd lieutenant in the army, and after further service in Alaska and the Philippines, was promoted major in the subsistence department (1900).

Brainard, JOHN GARDINER CALKINS (1796–1828), American poet and journalist, was born at New London, Conn., and graduated (1815) at Yale. He studied law, and practiced for a while at Middletown, Conn., but in 1822 removed to Hartford where he edited the *Connecticut Mirror* until failing health forced him to abandon the position in 1827. His own contributions to the paper were chiefly metrical. His *Poems* (1825) are included in a collection of his *Literary Remains* (1832), with a biographical introduction by Whittier.

Brain Coral (*Meandrina*), one of the madreporian or reef-forming corals, which has the surface of the corallum curiously convoluted, so that in the surface view of a dead mass it somewhat resembles the human brain.

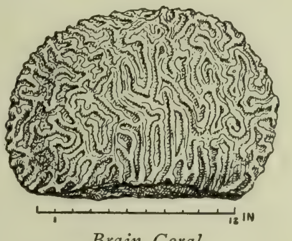
Braine-le-Comte (Flemish, *'s Graven-Brakel*), tn., prov. Hainault, Belgium, 18 m. S.S.W. of Brussels; makes lace thread. Pop. (1900) 78,694.

Brainerd, city, Minn., co. seat of Crow Wing co., 115 m. N.N.W. of St. Paul, on l. bk. of the Mississippi R., and on the N. Pac. and the Brainerd and N. Minn. R. Rs. There is a U. S. signal station, a Y. M. C. A. building and a lumbermen's hospital. Machine shops and car works of the Northern Pacific Railroad are situated here. Other important industries include the production of lumber, flour, cigars, and beer. Pop. (1910) 8,526.

Brainerd, DAVID (1718–47), American missionary, born in Conn., devoted his life to work among the Indians of Massachusetts, and those living near the Delaware and Susquehanna rivers, under the auspices of the Scottish society for promoting Christian knowledge. His *Journal* (1746) has taken rank as a religious classic. He died in the house of Jonathan Edwards, who afterward became his biographer (1749; new ed. 1884).

Braintree, tn., Norfolk co., Mass., 10 m. S.S.E. of Boston, on the N. Y., N. H. and H. R. R. It includes the villages of S. and E. Braintree, has the Thayer Library, and is the seat of Thayer Academy. The manufactures include electrical machinery, leather, shoes, carpets, absorbent cotton and paper. Granite is quarried. The portion of old Braintree now included in Quincy, was the birthplace of John Adams, John Hancock, and J. Q. Adams. Pop. (1910) 8,066.

Braithwaite, JOHN (1797–1870), English engineer, was born in London. In 1822 he devised the donkey engine. In 1829, in conjunction with Captain John Ericsson, he constructed for the Stephensons the locomotive engine the 'Novelty,' the first that ever ran a mile within a minute. He also manufactured the first practical steam fire-engine; and in 1833, with the assistance of Ericsson, he built the caloric engine. In 1836–8 he and Ericsson fitted a canal boat with screw propeller, which voyaged from London along the canals to Manchester, returning by way of Oxford and the Thames.



Brain Coral.

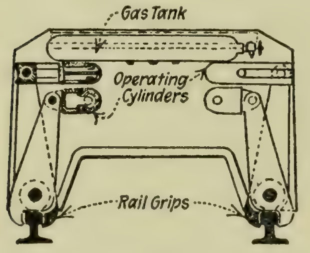
Brake or **Bracken** (*Pteris aquilina*) is of almost world-wide distribution. Its stem is a wide-spreading underground structure, covered with fine brown hairs, and giving off roots in all directions; this stem sends up each year a single leaf or frond, which may vary in height from six inches to twelve feet, according to the conditions in which the plant is growing. The spore cases occur in lines along the margin of the pinnæ. At the summit the leaf-stalk bears three branches, which are bipinnate; the pinnules are again pinnatifid, so that the frond has a broad, triangular effect. These fronds are used in Europe in large quantities for bedding cattle, and even in some instances for thatching stacks and houses; and the subterranean stem has been employed as an article of food, on account of the large quantity of starch and mucilage which it contains. The plant at one time was used medicinally, being bitter and anthelmintic.

Brakes are devices for arresting motion or for absorbing energy. The former are familiar in their use on ordinary vehicles, railway cars, and street cars. They are also necessary on elevators (lifts), on hoisting engines and appliances, and on inclined railways or cableways. There is a large variety of different forms for these various uses, and hand, steam, air, hydraulic, or electric power may be utilized for working them, often in conjunction with springs. Of course, all these brakes absorb power, but their direct function is to reduce excessive speed, or bring a moving machine to a stop. Absorption brakes (used in engine testing), however, primarily absorb energy (by converting it into heat), the engine running at uniform speed. The Prony brake, rope brake, and hydraulic brake are used for this purpose. They are also called absorption dynamometers. For brakes of this class see DYNAMOMETER.

A vehicle may be braked by means which tend to prevent the wheels from turning (wheel brakes), or by grips or friction devices which take hold of the track, and thus check the vehicle (track brakes). The former are most common. They comprise: simple or shoe brakes, in which a block (brake-shoe) fastened to the car is pressed against the wheel to resist its turning by producing friction between wheel and shoe; band or strap brakes, in which a loose band surrounding an enlarged hub of the wheel is drawn up tight, producing great frictional holding; disk brakes, in which a disk fast on the axle and a disk held by the car are pressed together to produce friction; cone or cup brakes, like disk brakes, but having instead of disks a cone and cup which are forced into each other; electric eddy-current brakes, in which a disk fast on the axle turns past the faces of an electromagnet so as to set up eddy-currents in the disk which resist the rotation; and electric generator brakes, which consist of a motor run reversed as generator, so that the induced currents drag back on the armature and resist the rotation.

Sand tracks, used on railways at times to prevent a car going beyond a fixed danger limit, are also brakes. They consist simply of a layer of sand over the track, 1 to 3 ins. deep over top of rail, which checks the wheels. This simple device, not much used, needs no further reference.

Of the above forms, *shoe brakes* exclusively are used for railway cars. The prototype (hand operated) is seen on ordinary vehicles. Railway car brakes are operated by hand and by power (steam, vacuum, compressed air). Street railway cars mainly use hand and air operated shoe brakes, but occasionally track brakes are employed, and electric cars may always be braked electrically through the motors.



Example of Gripping Track Brake.

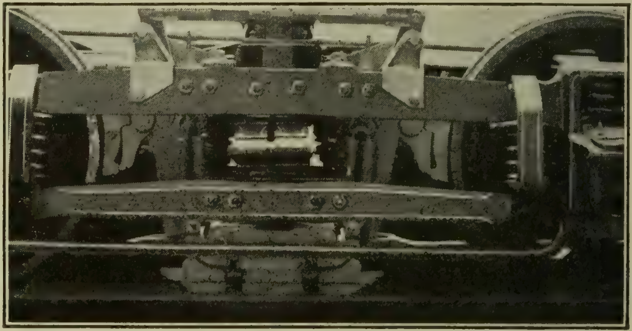
Compressed-Air Safety Clutch on an Incline Railway.

Band brakes are used on automobiles exclusively, and on hoisting-engines, crane motors, and electric elevator motors.

Disk brakes have been tried for street cars, but have been abandoned. The best example of the disk brake is found in the speed-governor of the phonograph, where a fly-ball governor presses against a friction disk when the correct speed is just exceeded. Some types of geared hoisting blocks use disk brakes to hold the load against running down. Cone brakes are sometimes used in such appliances.

Eddy-current brakes are used chiefly in electric meters, where they regulate the speed to the proper amount for correct registry.

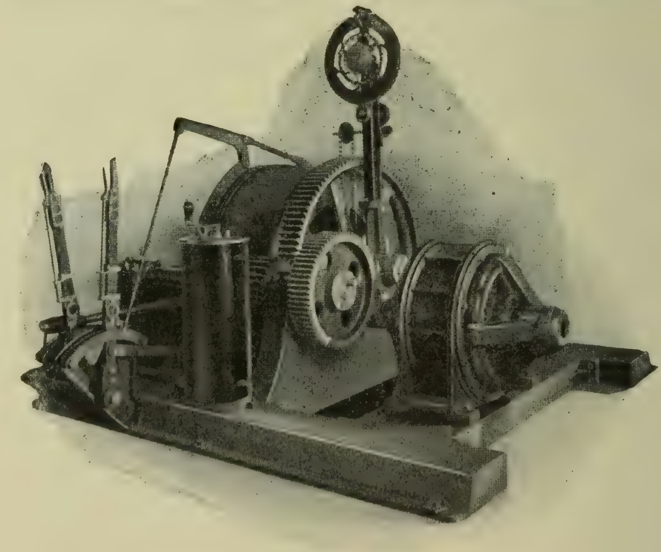
Track brakes are either simple friction shoes or gripping jaws. A track-brake frequently employed for electric cars uses friction shoes in conjunction with shoe wheel-brakes and electric braking. The motors are so connected (by shifting the controller to the braking point) that their rotation generates current at the expense of the car's momentum, which is sent through magnet windings on the track shoes, drawing these down upon the track by magnetic attraction. The drag of these shoes against the rail not only retards the car directly, but also through a set of links presses a set of brake shoes against the wheels. The gripping-jaw type of track brake, on the other hand, is used as safety brake on elevators, on inclined railways, and on cableways. In the first case it grips the guide bars; in the second, the head of the track-rail; and in the third, the carrying-rope. Usually, these safety brakes are thrown on by strong helical springs released by a trigger, which is worked either by hand or by a speed-governor. (Electric elevator motors similarly are braked by a band brake held in action by strong springs, and released only when current is applied to a set of magnets arranged to pull off the brake against the spring pressure.) In elevators and cable railway inclines, also, there is usually a spring-operated safety brake which is held off by levers on which the cables pull, so that if the cables should be broken the jaws will grip the rail and bring the car to a stop.



Electromagnetic Track Brake for Street-Cars.

The chief details which we can consider here are the arrangement and operation of band brakes and pneumatic railway brakes.

Band Brakes. The best form of band brake consists of a metal or leather band completely encir-



Band Brake on an Electric Hoisting Winch.

cling a smoothly turned hub or rim on the axle to be braked. The ends of a band are not joined directly, but have one of two forms of connection: (1) One end may be fastened to a fixed support adjacent to the brake rim, while the other end is hitched to a lever so pivoted that a pull on the handle exerts a multiplied pull on the band. The rotation of the axle should be in the direction from the fixed support toward the lever end of the band, so that the band tends to draw itself tight by the drag of the wheel, the lever having little more to do than take up the slack. (2) Both ends of the band may be fastened to the lever, being attached on the same side of the fulcrum, but at different distances from it. Such a brake, if these distances from the fulcrum are suitably proportioned, will draw itself tight just as soon as the lever is pulled enough to lay the band snug on the brake rim. An enormous braking force may be obtained with very slight pull on the lever; in fact, unless the band when released by the lever holds itself clear of the rim it may draw itself into full action by slight initial contact friction.

The Railway Air-Brake. Railway vehicles, which have smooth iron wheels running on smooth steel track, may be braked only with a limited force, for so soon as the wheels are held hard enough to slip on the track, or skid, the braking effect on the train is much reduced. On the other hand, short of skidding it is desirable to have the maximum braking force so that trains may be stopped at a reasonably short distance. Hand brakes are so slow in applying, and usually give so low a braking force, that modern fast railway traffic could not be operated safely or conveniently without a more rapid and powerful yet accurately controlled brake. The automatic compressed-air brake invented by George Westinghouse in 1872 meets these requirements almost ideally, and therefore it has been a prime factor in modern railway development.

Straight-Air Brake. For braking a single car, and sometimes for braking short trains, the fundamental or straight-air system of compressed-air braking is used. It comprises a cylinder fixed to the car floor, whose piston is linked to a set of levers arranged to press a brake shoe against each wheel. A steam or electric-driven compressor pumps air into a reservoir, and a hand valve may either admit compressed air from the reservoir to the cylinder or release air from the cylinder. The reservoir pressure being kept up to a fixed point—say 40 lbs. per sq. in.—the cylinder when fully charged will always exert the same piston pressure—hence the same brake pressure—which is adjusted to be a maximum, yet not able to skid the wheels.

This system, widely applied to electric cars, includes a compact motor-driven compressor and a pressure governor. The latter communicates with the air reservoir; when the reservoir pressure falls below normal, the governor throws an electric switch and starts the compressor, while as soon as the pressure is up to normal again it opens the switch and stops the compressor. Thus the brake apparatus requires no attention, the motorman simply applying or releasing the air as needed to check or again free his car.

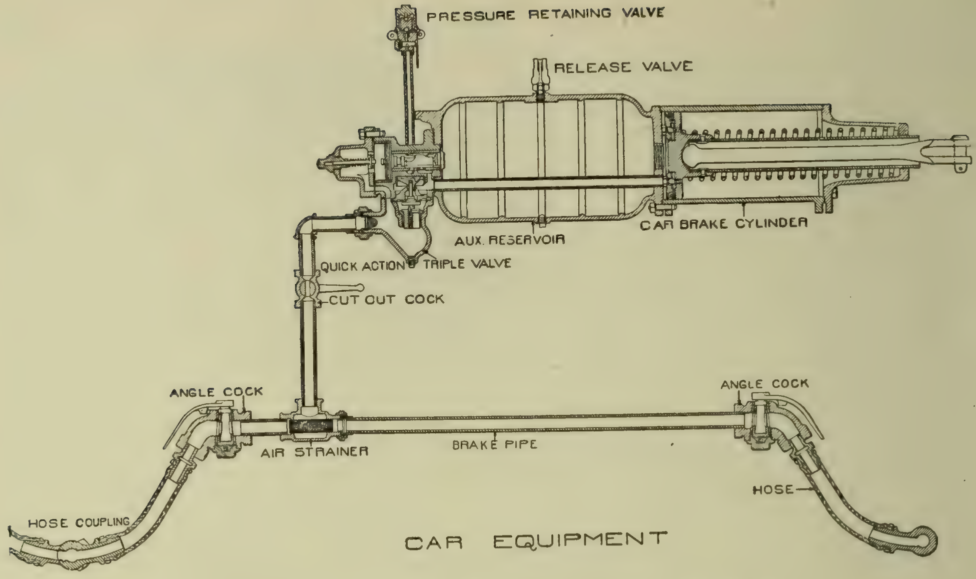
The Automatic Brake. If a train braked by the straight-air system were to pull in two, the air would all escape and no braking power would be left on either part. This dangerous condition must be avoided. Also, if in a straight-air system on a long train the engine-man (at the head end) were to open the brake valve and admit air through a continuous brake-pipe to the brakes of all the cars, the first cars would be braked first, while the air would flow slowly to the following cars, and so delay their braking; this would cause the train to crowd together with destructive force, and therefore such a brake system could not be used safely on long trains. Westinghouse's automatic brake system overcomes both of these difficulties. The primary part of each car equipment is the same as already described; *i.e.*, brake cylinder and system of brake rods and levers (the brake rigging); this cylinder is not supplied directly from the train pipe, however, but from a storage reservoir on the car itself (auxiliary reservoir). Between reservoir and cylinder is interposed a highly ingenious multiplex valve, the famous 'triple valve,' which controls the admission of air to the brake cylinder and its release therefrom. This valve is set in action by pressure fluctuations in the train pipe, as follows:

The train pipe normally is full of compressed air, at reservoir pressure. The engineer of the train has at his hand in the engine cab a valve controlling this train pipe—the engineer's valve. Turning its handle closes off the train pipe from the main or pump reservoir, and opens an exhaust hole which releases air from the train pipe. Now the train-pipe pressure falls, the wave of pressure-reduction passing through the train at high speed (with the velocity of sound). At each triple valve the pressure-reduction shifts a valve plug and opens temporary communication from auxiliary reservoir to brake cylinder. This sets all the brakes. Owing to the way the valve plugs of the triple valve are controlled, the braking force developed in the brake cylinders is proportioned to the pressure-reduction in the train pipe. Thus, the train pipe containing normally a pressure of 70 lbs. per sq. in., a reduction of 10 lbs. applies the brakes moderately, a reduction of 20 lbs. applies them about twice as hard, etc. For maximum rapidity of stopping the train in emergency (as to prevent collision), a further action is provided for: When the train-pipe pressure is reduced very sharply, by a large opening of the engineer's valve (or by an emergency valve contained in each car), the plug of the triple valve is thrown farther than ordinarily, and opens a passage from train pipe to the atmosphere so as to still further release air from the train pipe and reinforce the pressure-reduction wave traveling along the column of air in the pipe. This action gives the maximum braking force, in the shortest possible time.

With this system, when the train breaks apart it tears the hose couplings of the train pipe and releases the air in the latter very suddenly. This promptly applies the brakes on all cars of both parts of the train with 'emergency' force.

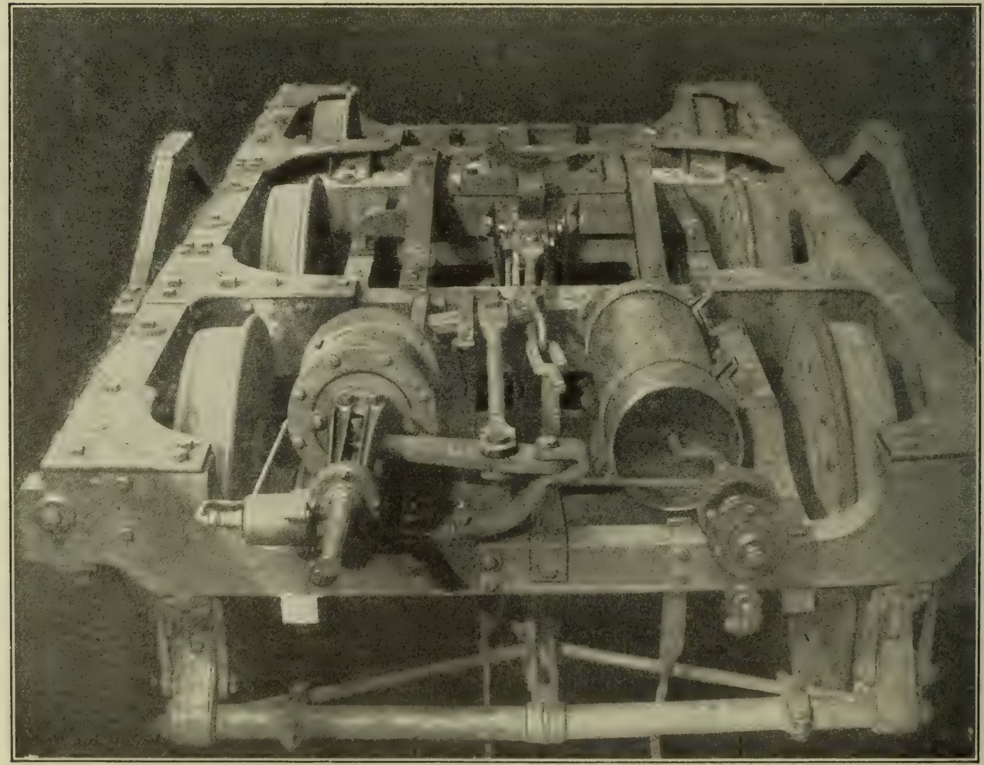
To release the brakes after having applied them, the engineer simply turns his valve so as to admit fresh compressed air from the main pump reservoir to the train pipe. The increase of pressure, when it reaches the triple valve of each car, returns the plug of the latter, connects the brake cylinder with the atmosphere so as to exhaust its contained pressure, and connects the auxiliary reservoir to the train pipe so as to recharge the auxiliary.

This system has been brought to a high degree of perfection by mechanical refinement of manufacture and by additional devices and improvements. A notable improvement is a brake system which permits of increased braking effect, based on a peculiar phenomenon. It is found that when a train is running at high speed, it can stand a much higher brake-shoe pressure, without skidding the wheels, than at low speed. It is permissible, therefore, to put a very high pressure into the brake cylinders at the start of the braking, provided this pressure is gradually reduced to about two-thirds the initial value as the train slows up. This principle is utilized by employing a very high reservoir pressure—even 100 or 110 lbs. per sq. in.—which goes



Detailed Diagram of the Air-Brake Apparatus on a Freight Car.

The hose at either end of the car is coupled to the hose of the adjoining car, so that the train pipe becomes continuous throughout the train. The pin at the end of the brake-cylinder piston rod is connected with a lever adapted to pull the eight brake shoes (one on each wheel) against the wheel rims.



Air-Brake Equipment on Passenger-Car Truck (car body removed.)

At the right is the auxiliary reservoir, with the triple-valve attached at the front. The brake cylinder is at the left, in front of it being the automatic brake-slack adjuster. The system of levers leads from the piston rod at the far end of the brake cylinder to the brake-beams. The brake-beam for the near pair of wheels is seen in the foreground, with brake shoes attached. The train-pipe, on the car body, will be connected with the pipe elbow at the bottom of the near side of the triple-valve.

into the brake cylinder when the brakes are first applied. The brake cylinder, however, has a small escape valve, through which its charge slowly escapes to the atmosphere, and this valve gradually closes under pressure of a spring. The adjustment of the device is such that by the time the train is nearly stopped the brake cylinder pressure is only moderate and the escape valve is shut, thus holding the brakes on.

In the practical application of the automatic brake, every car must be equipped with a longitudinal air pipe under the floor, provided at either end with a short length of hose, terminating in a coupling, so that it can be connected up with the adjoining cars. The locomotive carries a small direct-acting, steam-driven compressor, started and stopped by a governor controlled by the pressure in the main reservoir. The locomotive has also a set of brake shoes and cylinder and valve like each car, but usually the locomotive brakes can be applied independently of those in the train.

The use of the automatic air brake has been made compulsory on railways in the United States by Congress, as a necessary safety appliance, and it is now universal, every passenger car and practically every freight car being equipped with it.

A simple and useful brake for short trains is the ***vacuum brake,*** which acts somewhat in an opposite manner to the air brake. The brake cylinders work by having air exhausted from one side of the piston, so that the atmospheric pressure on the other side moves the piston and thus applies the brakes. A steam ejector on the locomotive produces the vacuum in the train pipe. Such brakes work very smoothly, but more slowly than the compressed-air brake.

Modern motor cars have commonly two sets of brakes, one set being used for ordinary purposes, and the other kept in reserve for emergency stops. The emergency brake is most often operated by a hand lever, with a pawl and ratchet to lock it in the applied position, and the other brake by a foot lever. (See MOTOR CARS.) So far, no form of brake has been devised for ships sufficiently successful to be generally adopted, although a system of wings or fins projected out into the water at right angles from the hull has been tried with modified success. Steamships, however, can reduce speed quickly by reversing their paddle wheels or propellers. In flying machines, a braking effect can be secured by tilting the height-control planes for a sudden rise (see FLYING MACHINES).

Bra'ma, or RAY'S BREAM (*Brama raii*), a genus of bony fishes of the Chætodontidæ. In this genus the body is laterally compressed and more or less deep, the spinous portion of the long dorsal fin is not well developed, and the tail is deeply forked. Its total length may be as much as 2 feet. The flesh is said to be good eating.

Bra'mah, JOSEPH (1748–1814), English mechanical inventor, was born at Stainborough in Yorkshire; worked for some time in London as a cabinet maker. In 1796 he invented the hydraulic press that bears his name (see HYDRAULIC MACHINERY). In 1806 he patented a machine for printing bank notes which was adopted by the Bank of England. He also devised improvements in locks, pumps, wheel carriages, engine boilers, fire engines, and paper making. Consult Smiles' ***Industrial** Biography*.

Bramante, brä-män'tā, DONATO D'AGNOLO (1444–1514), Italian architect of the Renaissance, was born near Urbino. He at first studied painting, but upon reaching Milan (1472) he devoted himself to architecture. He next settled (1499) in Rome, and became a favorite with Pope Julius II. His chief works are the joining of the Belvedere Palace with the Vatican by means of two grand galleries (*loggie*), and the rebuilding of St. Peter's at Rome, begun in 1506, and finished, with alterations by Michelangelo and others, after his death. In the Raphael Palace and the chancelry and church of San Lorenzo, in Rome, he showed a predilection for Grecian architecture, in which he instructed his nephew Raphael (q. v.), whose genius he was the first to bring to light. Bramante stands at the head of the Renaissance architects of Italy. Breadth, mass, and classic grace are the principal characteristics of his style.

Bramantino, brä-män-tē'nō, whose proper name was BARTOLOMMEO SUARDI (?1470–*c.* 1535), Italian painter of the Lombard school, born at Milan. He was the pupil of Foppa and Leonardo da Vinci, then of the architect Bramante, hence his cognomen ('Little Bramante'). He occupied an important position in Milanese art after the departure of Leonardo in 1499, and influenced Luini and Gaudenzio Ferrari. In the meantime, however, he seems to have accompanied Bramante to Rome; for in 1506 he collaborated with Sodoma in Rome upon frescoes in the Vatican, afterward destroyed and replaced by those of Raphael. His chief works are to be found in Milan. There are six panels of heads by him in the South Kensington Museum, and two frescoes in the Wallace collection.

Brambanan, bräm-bä'nän, or PARAMBANAN, a village of Java, 10 miles by rail east of Jokjokarta, with ruins of six groups of ancient temples, in all probability Buddhist. They resemble in plan and arrangement the famous temple of Boro-Budur. Local tradition puts their erection back to the second half of the thirteenth century. The edifices are composed entirely of hewn stone, and no mortar has been used in their construction.

Bramble. See BLACKBERRY.

Brambling, or BRAMBLE FINCH (*Fringilla montifringilla*), a beautiful little bird allied to the chaffinch (q. v.), which nests in Northern Europe and Asia, and migrates northward in autumn. It is occasionally caged for the sake of its song.

Bramhall, JOHN (1594–1663), Irish prelate; a scion of the Bramhalls of Bramhall Hall, Cheshire, England; passed over to Ireland in 1633 as Wentworth's chaplain, was consecrated bishop of Derry (1634), and became one of Wentworth's chief agents in his proceedings against the recusants and the covenanting Ulster Scots. On Strafford's impeachment Bramhall was also imprisoned and impeached by the Irish Commons, but was liberated by the king. At the Restoration he became archbishop of Armagh, and rigorously carried out his policy of compelling conformity.

Brampton, town, county seat of Peel county, Ontario, Canada, on the Grand Trunk and Canadian Pacific Railroads; 20 miles northwest of Toronto. It has manufactures of flour, boots and shoes, bricks, elevators, and office supplies. Pop. (1900) 2,748; (1911) 3,412.

Brampton, BARON. See HAWKINS, SIR HENRY.

Bramwell, SIR FREDERICK JOSEPH (1818–1903), British engineer, was born in London. After some experience as manager of an engineering factory, he started business as a civil engineer, and obtained an extensive practice. He was president of the Institute of Civil Engineers (1884–5), chairman of the executive committee of the Inventions Exhibition (1884), and president of the British Association (1888). In 1874–5 he acted as president of the Institute of Mechanical Engineers.

Bramwell, JOHN MILNE (1852), Scottish physician, was born at Perth, and studied in Edinburgh. He practised for some years at Goole in Yorkshire, and after 1889 attracted considerable attention by his publications on hypnotism and his treatment by suggestion. He settled in London in 1892. His works include: *James Braid, Surgeon and Hypnotist; Hypnotic Anæsthesia; Suggestion, Its Place in Medicine and Scientific Research; Dipsomania and its Treatment by Suggestion; Hypnotism: its History, Practice, and Theory* (1903); *Hypnotism and Treatment by Suggestion* (1909).

Bran is the material obtained from the outer covering or husk of grain during the process of grinding, and which is separated from the finer flour before the latter is made into bread. It is generally met with in commerce in thin, scaly, yellowish-brown particles, with sharp edges. Wheat bran is the most common kind, although rye, corn, and rice brans are sold in considerable quantities. In 100 parts of wheat bran, on an average, are approximately 12 parts of water, 6 parts ash, 15.5 parts protein, 4 parts fat, 9 parts fibre, and 53.5 parts nitrogen free extract.

The main uses to which bran is put are in the feeding of horses, cattle, and poultry, and in clearing and brightening goods during the processes of dyeing and calico printing. In the practice of medicine, bran is employed as a warm poultice in abdominal inflammation, spasms, etc., and an infusion is used as an emollient foot bath.

Bran, a name in Celtic legend variously associated with the hero of the Welsh *Mabinogion of Branwen*, the hero of the eighth-century Irish epic, *The Voyage of Bran*, and the dog in Ossian's *Fingal*.

Branch. See BRANCHING.

Branchiæ. See GILLS.

Branchidæ, brang'ki-dē, an ancient town near Miletus, on the coast of Asia Minor, famous for its temple and oracle of Apollo Didymæus.

Branching. When any part of a plant gives rise to second parts similar to itself, it is said to *branch*. Thus, a stem forms stem branches, and a root forms root branches. More strictly, however, the term is restrained to the ramification of stems. The growing point in many cryptogams forks constantly, while in the higher plants we have a potential branch in every vegetative bud except the terminal one which continues the main axis (see BUD). The number and position of the branches is thus in the first place determined by those of the leaves; but in the vast majority of cases such exuberant ramification is impossible, and many or most of such buds perish early or never even develop.

The general aspect of trees depends more upon their mode of branching than the form of exuberance of their foliage. The angle at which branches come off varies largely; usually ascending and acute, they may be at a right angle—*e.g.*, cedar—or even droop, as in 'weeping' trees. In the conifers, it may be noticed that the shortened branchlet of the larch, with its tuft of needle-like leaves, is represented in the pines by a still more reduced form, which has only two leaves, surrounded at the base by a number of bud scales. When the vegetative life of these ceases, the branchlet is disarticulated as a whole—a fact the more curious in relation to the separation of the large lower branches of the stem, which also snap off, leaving a clean cicatrix.

Branches may arise either from the sides of the parent structure (*monopodial branching*), or from division of its growing apex (*dichotomous branching*). In the former case the branch or branches may remain subordinate in size and position to the parent axis (*racemose branching*), or may displace and overtop it (*cymose branching*). In many forest trees—*e.g.*, lime, elm, birch, etc.—the buds which are formed throughout the growth of any one year grow out, during the following spring, into lateral branches, the branching being thus typically racemose. The last formed bud, however, grows very rapidly, and pushes to one side the prolongation of the main axis, taking its place, and becoming the main axis of the following year, so that the sequence of racemose branching is annually interrupted by the occurrence of a single cymose branching at the end of each year's growth.

In the common lilac, a very similar mode of annual cymose branching may be observed; but in this case the branches are arranged in pairs and the last pair of buds formed in each year grow equally, forming two main axes of the second year, while the prolongation of the preceding main axis dies. When two new main axes arise, as in the lilac, the cyme is said to be *biparous;* when only one, as in the lime, etc., it is said to be *uniparous.*

The underground branches of a rhizome are oftened thickened as *tubers;* or they may send up tertiary branches to become new ascending axes—the *suckers* of the raspberry or rose. A *stolon* is a prostrate branch which roots at the tips and then develops an ascending branch; it may often be long and threadlike, and is then called a *runner* (strawberry).

Bran'chiop'oda, a sub-order of Crustaceans in the order with leaf-like feet (Phyllopoda). The name ('gill-footed') refers to the fact that many of the numerous (10–40 pairs) appendages bear respiratory appendages. The body is distinctly jointed; the shell may be absent, shield shaped, or bivalved; there are well-developed steering antennæ; the eggs are borne on several of the legs, or, in Branchipus and Artemia, in a special brood sac. The heart is unusually elongated. They are mostly comparatively small, though not microscopic. None of the Branchiopoda are marine; a few live in salt lakes and brine pools; the rest in fresh water, in pools, ponds, marshes, lakes, etc.

Branco, Cape, bräng'kō, headland, Parahyba state, Brazil, 60 miles north of Pernambuco, forms the most easterly point of the South American continent.

Branco, Rio ('white river'), a river of Northern Brazil, rises in the Parima Mountains, between Venezuela and Brazil, and after a course of 400 miles joins the Rio Negro, a tributary of the Amazon.

Brancovan, bräng'kō-vän, CONSTANTIN (1654–1714), prince of Wallachia from 1688; rendered great service to the Porte in the campaign against Austria in 1690, and helped Tököly (q. v.) to become prince of Transylvania. In the contest between the Porte and Peter the Great of Russia his attitude was doubtful, but in the disastrous campaign of Peter the Great on the Pruth, when he was forced to make peace (1712), Brancovan again took the part of the Porte; whereas Dmitrii Cantemir, the prince of Moldavia, rendered all possible assistance to Russia. Notwithstanding that, Brancovan was accused of treason, deposed, carried prisoner to Constantinople, and put to death, together with his four sons (1714), and his fortune was confiscated. See ROUMANIA.

Brand is the mark made upon the skins of cattle for the purpose of recognition by the owner, as in cattle ranches, and is produced by searing with a hot iron; or a mark made in the same way on a cask or box for trade or excise purposes. The branding of criminals is treated in a separate article (see BRANDING).

Brand, bränt, SIR JAN HENDRIK (1823–88), president of the Orange Free State, was born at Cape Town. He practised as a barrister till 1863, when he was elected president of the Boer state, a position which he held for four successive terms of five years each. At the beginning of the struggle between Great Britain and the Transvaal in 1880, Brand maintained the strict neutrality of his republic, and was present as mediator in 1881 at the conference which led to the final arrangement of peace after the British defeat at Majuba Hill.

Brand, JOHN (1744–1806), English antiquary, born in Durham.

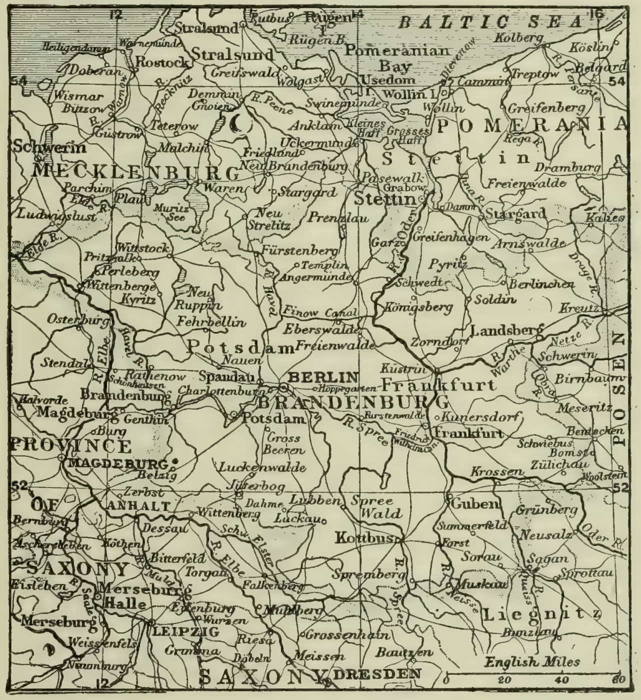
In 1784 he was presented to a rectory in the city of London, and in the same year became secretary of the Society of Antiquaries. His *Observations on Popular Antiquities*, first published in 1777, and edited with additions by Sir Henry Ellis (3 vols. 1813), was corrected, extended, and rearranged alphabetically as *Faiths and Folklore of the World* by W. C. Hazlitt in 1905.

Brande, WILLIAM THOMAS (1788–1866), English chemist, was born in London. He became professor of chemistry to the Apothecaries' Company (1812), succeeded Davy in the same capacity at the Royal Institution (1813), and in 1854 became chief officer of the coinage department at the Mint. He was author of a *Manual of Chemistry* (1819), *Elements of Chemistry* (1831), and a *Dictionary of Pharmacy and Materia Medica* (1839), and edited the *Dictionary of Science, Literature, and Art.*

Brandegee, FRANK BOSWORTH (1864), American legislator, was born in New London, Conn. He was graduated from Yale in 1885, and was admitted to the bar. In 1888 he was elected to the State assembly, and again in 1899, when he was speaker. From 1902 to 1905 he was a member of Congress; and from 1905 to 1915 was U. S. Senator.

Brandeis, brän'dīs, FREDERICK (1835–99), Austro-American musician, was born in Vienna, and studied the pianoforte and composition under Viennese masters. He was brought by his parents to America in 1849, and after engagements in concert tours, settled in New York in 1855. There he occupied himself with composition and as an organist, holding positions in several prominent churches. His orchestral compositions include *Dulce est pro Patria Mori* and *Prelude to Schiller's 'Maria Stuart,'* and many pieces for the organ, piano, and voice. He is the composer of 'My Love is like the Red, Red Rose.'

Brandeis, LOUIS DEMBITZ (1856), American jurist and U. S. Supreme Court Justice, was born in Louisville, Ky. He was graduated from the Harvard Law School in 1877, after which he took up the practice of law in Boston. In 1908 he was counsel for the Anti-Merger League, to prevent the merger of the New York, New Haven, and Hartford and the Boston and Maine Railroads; in 1910 counsel for Louis B. Glavis in the Ballinger-Pinchot investigation; and in 1911 and 1913 counsel for shippers in the advanced freight rate investigations before the Interstate Commerce Commission. He has been counsel for the people in the proceedings involving the constitutionality of the women's ten-hour laws in Oregon and Illinois, the California eight-hour law, and the minimum wage law in Oregon; and for the preservation of the Boston municipal subway system, and the establishment of the Boston sliding scale gas system and the Massachusetts savings banks insurance. In 1910 he was chairman of the arbitration board in the New York garment workers' strike. He was appointed by President Wilson in 1916 to succeed Justice Lamar, deceased, as Associate Justice of the U. S. Supreme Court—the first Hebrew to hold that office.



The Province of Brandenburg.

Brandenburg, brän'den-bōōrch, province of Prussia, occupying the middle of the North German plain—*i.e.*, the Havel-Spree depression, the valleys of the middle Oder and its tributary the Warthe, and a part of the valley of the middle Elbe. Forty-six per cent. of the area is under cultivation, the most fertile land lying in the north and middle. Fruit, flax, hemp, and vines are cultivated. In the south, forests cover thirty-two per cent. of the area. Lignite is mined to the annual value of $3,750,000; other mineral products are iron, lime, and gypsum. Shipping, agriculture, and the rearing of cattle afford occupation for a considerable number of the inhabitants. The chief manufactures are cotton, wool, linen, sugar, glass, tiles, and machinery. There are also numerous distilleries. Berlin is the capital. Other important towns are Frankfort-on-the-Oder, Potsdam, Charlottenburg, Spandau, and Brandenburg. Area, 15,383 square miles. Pop. (1900) 3,108,554; (1910) 4,092,616.

In the beginning of the Christian era Brandenburg was inhabited by the Semnones, and afterward by Slavonic tribes. In 927 Henry I. defeated the latter at the Elbe, and plundered their capital of Brennibor, afterward raising the district into a *Mark.* Albert the Bear became the first Margrave in 1134, and in 1356 it was made an electorate of the empire. In 1415 the emperor conferred the electoral dignity of Brandenburg upon Frederick, burggrave of Nuremberg, of the house of Hohenzollern. The mark or electorate became united with the duchy of Prussia in 1611, which, under the great elector, Frederick William I., shook off the suzerainty of Poland in 1657, to become, under the great elector's son Frederick, in 1701, the kingdom of Prussia. See PRUSSIA.

Brandenburg, town, province, Brandenburg, Prussia, on the

River Havel; 38 miles southwest of Berlin. It produces baskets, bricks, leather, flour, and silks. From 949 to 1544 it was the seat of a bishop. Pop. (1910) 53,456.

Brandes, brän′des, Carl Edvard Cohen (1847), Danish author, brother of Georg Brandes (q. v.), distinguished himself early as an Orientalist and original dramatist, as a member of the Folkething, as one of the best debaters of the Left since 1880, and as assistant editor of the influential *Morgenblad*, and subsequently of *Den Politiker*. Like his brother, a decided radical, with a somewhat pessimistic point of view, his brilliant talents are counterpoised by an irritating dogmatism. He has written several plays—*e.g.*, *Lägemidler* (1881), *Et Besög* (1882), *Under Loven* (1890), *Asgerd* (1895), *Vera* (1904), and *Haardt imod Haardt* (1904). A romance by him, *Jung Blut* (1899), led, because of its unveiled naturalism, first to a bitter controversy, and finally to a prosecution and fine.

Brandes, Georg Morris Cohen (1842), Danish author and literary critic, of Jewish extraction, was born in Copenhagen. After graduating from the Copenhagen University (1864) he spent much time in travel and study in England and on the Continent, coming under the influence of Renan, Taine, and John Stuart Mill, to whose teaching the philosophical basis of his criticism may be traced. During this period he published *Æsthetic Studies*, *The French Æsthetics of Our Day: An Essay on Taine*, *Criticisms and Portraits*, and a translation of Mill's *The Subjection of Women*.

Brandes returned to Copenhagen in 1871, and as privatdocent in the University delivered the first of his great series of lectures on *Main Currents in the Literature of the Nineteenth Century* (published in 6 vols., 1871–82; Eng. trans. 1886). These lectures, attacking as they did the traditional prejudices and beliefs of Denmark, aroused a storm of protest from the orthodox, but gave Brandes a large following among the younger radicals. He defended himself in a number of able pamphlets and through the columns of *Nyt Dansk Maanedskrift*, and of *Det Nittende Aarhundrede*, of which he was coeditor (1874–7). In 1877 he removed to Berlin, where he remained until 1883, when he returned to Copenhagen as a public lecturer. He was later made professor in the University. In 1914 he made a brief visit to America.

The influence of Brandes in Scandinavia and on the Continent has been incalculable, though his one-sidedness and strong antipathies sometimes obscure his judgment, and his anti-clericalism closely approaches fanaticism. His great accomplishments have been the breathing of a new spirit into Danish literature and the substitution of a scientific method of criticism for narrow traditional standards of literary value.

Works not already mentioned include: *Danish Poets* (1877); *Ferdinand Lassalle* (1877; Eng. trans. 1911); *Lord Beaconsfield* (1879; Eng. trans. 1880); *Eminent Authors of the Nineteenth Century* (1882; Eng. trans. 1886); *Men and Works in European Literature* (1883); *Berlin as an Imperial Capital* (1884); *Impressions of Poland* (1888; Eng. trans. 1903); *Impressions of Russia* (1888; Eng. trans. 1889); *Essays* (1890); *William Shakespeare* (1898; Eng. trans. 1898), a remarkably sympathetic and authoritative study of the great English dramatist; *Poems* (1899); *Anatole France* (1905; Eng. trans. 1908); *Recollections of My Childhood and My Youth* (Eng. trans. 1900); *Erinnerungen* (1908).

Branding (cognate with Ger. *brennend*, 'burning') primarily denotes the impressing of a mark with hot iron upon men, beasts, or inanimate objects. From early times it was customary to brand felons and slaves with certain marks, which, being indelible, distinguished them for life from their fellow men. Hence the secondary application of 'brand' and 'stigmatize.' The Greeks marked their slaves with the *stigma;* in Rome runaway slaves (*fugitivi*) and thieves (*fures*) were branded with the letter F; and slaves and convicts were also branded on the forehead for identification.

Offenders against English law were branded on the breast, on the cheek and forehead, on the shoulder and hand, and on the cheek alone, according to circumstances, usually with a certain letter denoting the offence. Branding was the custom in France, where, until 1832, a letter or letters were branded on the shoulder of a galley slave; previously, the *fleur-de-lis* was the mark impressed. The famous Statute of Vagabonds under Edward VI. authorized the branding of the letter V on the breast of a runaway servant. In the same reign brawling in church was punished by branding with the letter F on the cheek as a fraymaker. In Great Britain, as in France, branding was abolished before the middle of the nineteenth century.

In the United States, branding was practised to some extent in colonial times; and Southern planters were in the habit of branding their slaves on the hand with the master's initials before the Civil War.

Brandis, brän′dis, Christian August (1790–1867), German philologist and philosopher, was born in Hildesheim, and was professor of philology at Bonn from 1822 till his death. He visited the principal libraries in Europe to prepare, with Bekker, the edition of the works of Aristotle (1831–6) undertaken by the Berlin Royal Academy of Science. His principal work was *Handbuch der Geschichte der Griechisch-römischen Philosophie* (1835–66).

Brandl, brän′d'l, Alois Leonhard (1855), Austrian student of English literature, born at Innsbruck. He became professor of philology successively at Prague (1884), Göttingen (1888), Strassburg (1892), and Berlin (1895). He has written: *Coleridge und die Englische Romantik* (1886; Eng. trans.); *Geschichte der Mittelenglischen Litteratur* (1892); *Die Quellen des Weltlichen Dramas in England vor Shakespeare* (1898); *Persönliche Eindrücke von Amerikanischen Universitäten* (1907); *Geschichte der Altenglischen Litteratur* (1908); and edited a new issue of Schlegel and Tieck's German translation of Shakespeare.

Brandling (*Lumbricus fœtidus*), an earthworm remarkable for its banded body. It is a small species, and much prized by anglers as bait.

Brandon, city, Manitoba, Canada, county seat of Brandon county, on the Assiniboine River, and the Canadian Pacific and Canadian Northern Railroads; 130 miles west of Winnipeg. It is the seat of a government experimental farm, Indian industrial school, insane asylum, and Baptist college. It is an important shipping point for wheat and lumber, and has grain elevators, flour and saw mills, machine shops, pump works, and breweries. Pop. (1901) 5,620; (1911) 13,839.

Brandon, town, Rutland county, Vermont, on the Rutland Railroad; 16 miles northwest of Rutland. Fine marble is quarried; bog iron, manganese, kaolin, and lignite are mined; and carriages and flour are manufactured. Pop. (1900) 2,759; (1910) 2,712.

Brandon, town, partly in Suffolk and partly in Norfolk, England, on the Little Ouse; 7 miles northwest of Thetford. The free grammar school dates from 1646. Considerable trade is done in grain, timber, coal, and rabbit skins. In 1870 implements of Neolithic times were discovered here. Pop. (1910) 5,863.

Brandon, Charles, Duke of Suffolk. See Suffolk.

Brandon, RICHARD (d. 1649), succeeded his father as public executioner (1640) of England, and is said to have beheaded Charles I., Strafford, Laud, and others.

Brandon, ST. See BRENDAN, ST.

Brandt, bränt, ENEVOLD, COUNT (1738–72), Danish statesman, was, through the influence of his friend Struensee (q. v.), appointed (1770) chief warder to the imbecile Christian VII. As *maître de plaisir* of the court, he spent vast sums in frivolous amusements. His jealousy of Struensee led him to plot against that minister; but before he could take any action he was involved in the ruin of his former friend, and was beheaded.

Brandy (German *Branntwein,* 'burnt wine'; French *eau de vie*), a spirit prepared by the distillation of wines, the quality depending not only on the process, but also on the wine.

The fermented liquors or wines which are employed for the purpose are various, and contain a proportion of alcohol which runs from 10 to 25 per cent. of their weight. The red wines generally are preferred. In the seventeenth century French brandy was made only from white wine. About 1,000 gallons of wine give by distillation from 100 to 150 gallons of brandy, which varies in strength, but is generally diluted with water. When originally distilled, brandy is clear and colorless, and if wished to remain so, is received and kept in glass vessels; but when placed in wooden casks the spirit dissolves out the coloring matter of the wood, and acquires a light sherry tint, which may be deepened by burnt sugar and other coloring matter. The spirit owes its flavor and aroma to the presence of small quantities of furfurol, œnanthic, acetic, butyric, and other ethers. It contains from 47 to 80 per cent. of alcohol, the average being about 54 per cent.; the specific gravity varies from 0.9274 to 0.9342. Like other liquors, brandy is often concocted of alcohol flavored with the above ethers and diluted with water.

The most famous brandy is that distilled in the country round *Cognac,* in Charente, in the west of France. *Armagnac* is the brandy of another French district. The Germans use the name *Branntwein* for all kinds of grain spirit, or that distilled from plums, blueberries, etc. *Kirschwasser* or *kirschbranntwein* is distilled from cherries and their kernels. In the United States, brandy is also manufactured from cherries, apples (see APPLE JACK), pears, peaches, and other fruit.

Brandy, like other spirituous liquors, is subject to considerable adulteration, and it is a difficult matter to discriminate between the genuine article and a sophisticated or 'silent spirit' brandy. Generally it is agreed that a neutral spirit obtained by a patent still is not a true brandy; while a genuine brandy may be defined as one distilled from grape wines by a pot still. The best comes from the Charentes in France; but California, Australia, Spain, Algeria, Greece, Egypt, and Canada all export brandy. The Martell Star brandies are examples of genuine cognacs, rich in esters. Unfortunately, most of the French brandies are patent still products; hence many of them outside the Charentes are blended with cognac to improve their quality.

In deciding between brandies an analyst should determine the ethers (esters), furfuroid bases, acidity, aldehydes, and higher alcohols. The minimum for esters should be about 80 parts per 100,000 pure alcohol, and for furfurol about 0.75 part. This standard does not apply to vintage brandies, where the esters are often much lower. Examples:

QUANTITY IN PARTS PER 100,000 OF PURE ALCOHOL.

Constituents.	Genuine Brandy from Inferior Wine.	Genuine Cognac.	Sophisticated Brandy.
Acidity	35.38	94.76	51.8
Aldehydes	24.55	10.68	12.7
Alcohols (higher)	173.60	287.94	422.9
Ethers (esters)	98.71	116.82	40.8
Furfuroid bases	1.39	4.88	2.9
Total	333.63	515.08	531.1

Brandy is frequently administered as a stimulant, and in cases of suspended animation, exhaustion, and in mild diarrhœa. It may be used externally for checking hemorrhage and for hardening tender skin. See ALCOHOL; WINE.

Brandy Station, village, Culpeper county, Virginia; 55 miles southwest of Washington. It was the scene of several cavalry fights of the Civil War, notably those of June 9 and Oct. 11, 1863. In the former the Federals were defeated by the Confederates under General Stuart.

Brandywine, Battle of. Brandywine Creek, near Chadd's Ford, 50 miles from Philadelphia, was the scene of one of Washington's defeats. The British, under Howe and Cornwallis, landed 18,000 troops on the shores of Brandywine, intending to march to Philadelphia, but were opposed by 11,000 troops under Washington. After a frontal attack, Washington, receiving no help from Sullivan, was forced to retreat and abandon Philadelphia (Sept. 11, 1777).

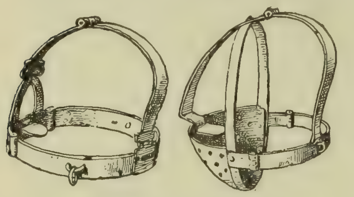
Brandywine Creek flows southeast through Chester county, Pa., and joins Christiana Creek near Wilmington, Del. It was the scene of the Battle of Brandywine (q. v.).

Branford, town and borough, New Haven county, Connecticut, on the Long Island Sound, and the New York, New Haven, and Hartford Railroad; 6 miles southeast of New Haven. The town is a summer resort, and has a good harbor. The Blackstone Memorial Library is a fine marble building. Manufactures include locks and hardware. Oyster culture, fruit farming, and granite quarrying are important industries. It was settled in 1644, and was originally called Tekotet. Pop. (1910) town, 6,047; borough, 2,560.

Brangwyn, FRANK (1867), English painter and etcher, was born in Bruges, Belgium. He worked for William Morris with designs for tapestries, etc., but left him when only sixteen and went to sea. He became president of the Royal Society of British Artists, and a member of the National Academy. His paintings include: *Ashore* (1890); *Burial at Sea* (1891); *Salvage* (1891); *Convict Ship* (1892). His work is bold in design, rich in coloring, and essentially decorative. Renan wrote of his pictures, 'The eye rejoices before them; they swim in color.' His *Trade on the Beach* (1895) is in the Luxemburg, Paris; *The Scoffers* in the Sydney National Gallery; *St. Simon Stylites* in Venice; and his panel *Commerce* in the Royal Exchange, London. Among his etchings are: *Old Houses in Ghent; London Bridge; The Sawyers; The Paper Mill.* In 1915 he decorated the East Pavilion of the Panama Exposition. Consult S. Sparrow's *Frank Brangwyn* (1910).

Brank (in England), or BRANKS (in Scotland), a kind of bridle made of iron bands, formerly used to punish scolding women and those guilty of slander. It was occasionally used as a punishment for fornication, and, still more rarely, for men guilty of abusive language. Nearly all dated specimens in British museums belong to the sixteenth and seventeenth centuries. The use of the brank in Great Britain died out about the middle of the nineteenth century.

Brankovich, GEORGE, prince of Servia from 1425, with intervals, to 1455, served in the Turkish army under Bayazid II., and was made prisoner by Tamerlane. Two years after he became prince of Servia, Sultan Murad II. invaded that country, and Brankovich was forced to give up a part of it, to recognize the Turkish suzerainty over the part left to him, and to give his daughter to the Sultan in marriage. After being expelled from Servia, he took part with Janos Hunyadi (q. v.) in his expedition against the Turks, and regained the independence of Servia in 1444. After that, however, he was in continual conflict with Hunyadi, who often invaded Servia.



Specimens of Branks.

Branly, EDOUARD (1844), French scientist, was born in Amiens, and was educated at the Ecole Normale Superieure there. He then became professor at the College of Bourges, and subsequently director of physical instruction at the Sorbonne, where he remained until 1876, when he commenced a series of lectures in natural philosophy at the free school for advanced students. He has made numerous important researches in the field of electricity, including the invention of a valuable wireless telegraph receiver, and discoveries of electrostatic phenomena in batteries, positive discharge by gases, violet rays and incandescent bodies, and secrecy of wireless communication. For his exposition of radio-conductors the Paris Academy of Sciences awarded him the Houllevigue Prize. For his wireless investigations he was made a Chevalier of the Legion of Honor, and Pope Leo XIII. invested him with the Order of Commander of St. Gregory the Great.

Brann, HENRY ATHANASIUS (1837), American priest, was born in Parkstown, County Meath, Ireland, and came to the United States with his parents when twelve years old. He studied at St. Francis Xavier College at New York, St. Sulpice at Paris, and the American College at Rome, and was ordained in the Roman Catholic Church (1862). In 1863 he built the church of St. Cecelia in Englewood, N. J., and from 1870 to 1890 was rector at Kingsbridge and Fort Washington, New York City. Since 1890 he has been rector of St. Agnes' Church in that city. His congregation of about 10,000 is one of the largest in the city, largely composed of the traveling public and of dwellers in the great hotels. In 1910 the Pope made him a domestic prelate with the title of monsignor, and in 1912 he celebrated his golden jubilee as a priest. He has published: *The Age of Unreason* (1881); *Immortality of the Soul* (1882); *Life of Archbishop Hughes* (1909); *Waifs and Strays* (1909); *Life of Vincent de Paul* (1915).

Brannan, JOHN MILTON (1819–92), American soldier, was born in the District of Columbia, and graduated from West Point (1841). He served with distinction in the Mexican War, being brevetted captain for bravery at Contreras and Churubusco, and was employed in regular army duties until the outbreak of the Civil War, when he was appointed brigadier-general of volunteers. During 1862 and 1863 he was in command of the Department of Key West and on duty in the Department of the South; and from 1863 to the end of the war he was chief of artillery in the Department of the Cumberland. He was present at Chickamauga, Missionary Ridge, and the siege of Atlanta, and was brevetted major-general of the regular army in 1865. He was in charge of the troops at Ogdensburg, N. Y., at the time of the proposed Fenian raid into Canada in 1870, and he suppressed the railroad rioters in Philadelphia in 1877.

Branner, JOHN CASPAR (1850), American geologist, was born in New Market, Tenn., and was graduated from Cornell (1874). He entered the service of the Brazilian government as geologist (1875–7), and remained in Brazil in a private capacity and as the agent of the American Government until 1883. In 1885–92 he was professor of geology at the University of Indiana; and in 1892 became professor of geology at Leland Stanford University. In 1899 he was director of the Branner-Agassiz expedition to Brazil; in the same year became vice-president of Leland Stanford University; and in 1911 directed another expedition to Brazil. He has published: *From School to College* (1905); *Geologic Work of Ants in Tropical America* (1911).

Brant (*Branta bernicla*), a small species of wild goose breeding among the Arctic Islands, and wintering along the Atlantic Coast of Europe and of North America as far south as North Carolina. It measures from 23 to 26 inches in length. The head, neck, and tail are black, with a small but conspicuous white patch on the neck; the back and wings brown; the under parts light gray and white. The birds fly in compact bodies, high over the sea and well out from the coast, feeding chiefly on eelgrass, which they tear up by the roots at low tide. Taken in early winter, the young are delicious game birds.

The Black Brant (*B. nigricans*) is a Pacific Coast species similar to the common brant. It breeds on the northeastern coast of Siberia, in Northern Alaska, and in the western part of the North American Arctic archipelago. The Snow Goose (*Chen hyperborea nivalis*) is sometimes known as the White Brant, and the American White-fronted Goose as the Gray or Prairie Brant.

Brant, JOSEPH (THAYENDANEGEA) (1742–1807), a noted Mohawk Indian chief. Through the favor of Sir William Johnson he was educated at Eleazer Wheelock's school at Lebanon, Conn. He fought with the English against the French in the French and Indian War, and against Pontiac in 1764. Becoming a missionary of the Church of England among his people, he translated the *Prayer Book* into the Mohawk language. In the American Revolution he received from the English a commission as colonel, and was a prominent figure in the frontier warfare in Western New York, sharing in the Cherry Valley Massacre (q. v.) and the Battle of Oriskany (q. v.). He was not present at the Wyoming Massacre (q. v.), as the English poet Thomas Campbell in his *Gertrude of Wyoming* represents him to have been. He consistently treated his prisoners with humanity. After the war he settled in Upper Canada, once more as a missionary of the Church of England, and is said to have founded the first Episcopal Church ever established in Canada. In 1786 he made a visit to England, and was entertained by Burke, Sheridan, and others. By some writers he is regardest as the ablest of all the Indian leaders in America. Consult Stone's *Life of Joseph Brant;* Eggleston and Seelye's *Brant and Red Jacket* ('Famous American Indians').

Brant, or BRANDT, SEBASTIAN (1457–1521), German poet and humanist, went to Basel in 1476;

became licentiate of canon law (1481) and doctor of law (1489), and in 1501 returned to Strassburg, his native city, which he served, first as syndic and later also as town clerk, until his death. He wrote many works both in Latin (mainly religious and political) and German, in prose and verse, popular and learned. The most successful of these was his famous satire *Narrenschiff* (1494), an account in Alsatian verse illustrated by rough woodcuts, of a ship sailing to Narragonia (Fool's Land), and having on board over a hundred fools, each having some representative folly. It was translated into Latin by Locher in 1496, and achieved great popularity; Low German and French translations appeared in the same year, and a Dutch translation in 1500. The English rendering of 1507 goes back to the French; but Barclay's *Ship of Fools* (1509) is mainly a free translation from Locher's Latin. The *Narrenschiff* has been edited by Zarncke (1854) and Goedeke (1872); an edition, with all the designs of the original, was issued by Bobertag in 1891.

Brant'ford, city, Ontario, Canada, county seat of Brant county, on Grand River, and on the Canadian National, the Toronto, Hamilton and Buffalo, and the Canadian Pacific Railroads; 25 miles southwest of Hamilton. Local electric lines connect with surrounding towns, and the Provincial and International Highways pass through the city. It is the seat of the Provincial School for the Blind, Collegiate Institute, a U. S. consular agency, and Mohawk Indian Institute; is the headquarters of the Indian Six Nations; and has a hospital and sanatorium, Soldiers' Home, Library, Y.M.C.A. and Y.W.C.A. buildings, and several parks.

Originally the centre of an excellent farming region, the city is now noted for its manufactures, the most important of which are agricultural implements, bricks and other clay products, iron, steel and wood products, electrical fittings, motor trucks, automatic scales, pumps, varnishes, silk, and clothing. The city's electrical power is supplied from Niagara Falls. Brantford was founded in 1823 and named in honor of Joseph Brant, the famous Mohawk chief, to whose memory a monument was erected in Victoria Square in 1887. Pop. (1901) 16,619; (1910) 23,132; (1920) 29,440.

Branting, Karl Hjalmar (1860–), Swedish statesman, leader of the Social Democratic Party, was born in Stockholm. He was educated at private schools in his native city and at the University of Upsala, and entered the journalistic field. He became editor of a small socialistic paper *Tiden* and later of the *Social-Demokraten*, and before long was known as the leading speaker and worker in the Social Democratic movement. In 1896 he was elected to the Swedish Riksdag, the first Social Democrat to sit in that body. He was premier of Sweden from March to December 1920, and was again elected to that position in October 1921. He was Swedish delegate to the League of Nations Assembly 1920–22, and received the Nobel Peace Prize in 1921.

Brantôme, bräṅ-tōm, Pierre de Bourdeilles, Seigneur de (?1540–1614), French chronicler, was born in Périgord, of a noble family. He became abbé de Brantôme when only sixteen, but the greater part of his life was passed as a soldier and courtier. He accompanied Mary Queen of Scots to Holyrood in 1561, and afterward fought against the Huguenots in the first (1562) and third (1573) religious wars, and against the Turks (1564 and 1566). He was chamberlain to Charles ix. and Henry iii.; but after the death of his patroness, Catherine de' Medici, he retired to Brantôme, and wrote his famous *Mémoires*.

Bras d'Or, brä dor', Lake, a gulf, Cape Breton Island, Canada, 50 miles long by 20 miles broad. The south end is connected by a ship canal with St. Peter's Bay, thus bisecting Cape Breton Island (q. v.).

Brasenose College. See Oxford.

Brash. See Pyrosis.

Brashear, John Alfred (1840-1920), American manufacturer of astronomical and physical instruments, was born in Brownsville, Pa. He was educated in the public schools and at the age of sixteen was apprenticed to learn the pattern maker's trade. In 1870 he began constructing astronomical instruments. He was acting director of the Allegheny Observatory, and acting chancellor of the Western University of Pennsylvania (now the University of Pittsburgh), and received many honorary degrees in America and in Europe.

Brasidas, bras'i-das, son of Tellis, was the most famous and successful Spartan commander in the earlier part of the Peloponnesian War. He saved Methone from an Athenian invading force (431 b. c.), became ephor, and distinguished himself at Pylos in 425 b. c. The next year he defeated the Athenians outside Megara, and secured that city to Sparta. He was then on his way to Chalcidice, in Thrace, to stir up disaffection among the Athenian subjects. Arriving there, he succeeded, by his policy of moderation and his energy, in securing Acanthus, Stagirus, Amphipolis, Scione, and Mende. He also accompanied Perdiccas, king of Macedonia, on an expedition against the Lyncestians, proving his military ability by a skilful retreat under difficulties. In 422 b. c. he gained a complete victory over an Athenian force under Cleon which was attempting to recover Amphipolis, but fell in the battle.

Brass, an alloy of copper and zinc in various proportions. The alloy was known to the Romans, though bronze, the alloy of copper and tin, was the material most used by the ancients. Brass is prepared by fusing the metals in the proportions of about three of copper to from two to one of zinc in plumbago or clay crucibles. First a little scrap brass is melted in the crucible with some flux or powdered charcoal; the copper is then added, and, when it is melted, the zinc. After it has stood in the furnace for some time, the alloy is cast into ingots or moulds. Sheet brass is prepared by casting into strips, and these are passed cold through rolls. The proportion of the two metals varies greatly according to the uses to which the alloy is to be put. A large proportion of zinc increases the lightness of the color, but reduces the tenacity and ductility of the alloy. Brass is highly tenacious, malleable, and ductile, and makes good castings. The addition of two to four per cent. iron gives a very hard and tenacious metal. Brass fittings in machinery are used for the bearings in which a revolving journal lies. This comparatively soft metal is introduced so that the shaft may not wear away.

Brasses. See Monumental Brasses.

Brasseur de Bourbourg, brä-sûr' d*e* bo͞or-bo͞or', Charles Etienne (1814–74), French abbé, was born in Bourbourg. Proceeding to the United States in 1846, he was vicar-general at Boston, then a missionary (1848–64) in Central America and Mexico. He was the author of *Histoire de Canada* (1851), *Histoire . . . du Mexique et de l'Amérique Centrale dans les siècles antérieurs à Christophe Colombe* (1857–9), and other works dealing with the Maya civilization.

Bras'sey, Thomas (1805–70), English engineer and railway contractor, was the son of a Cheshire farmer. In 1834–5 he executed contracts on the Grand Junction and London and Southampton Railways, and in 1836 moved to London, and began business in a large way as a railway contractor.

In 1847 and following years he constructed the Great Northern Railway, as well as railways in France, Italy, Spain, Canada, Australia, and India, the Crimean Railway, the Victoria Docks, London, and the East London Railway. His last contract was the Wolverhampton and Walsall Railway. He was said to have left a fortune of about £7,000,000.

Brassey, THOMAS, FIRST EARL (1836–1918), son of Thomas Brassey (q. v.), was born in Stafford, England. He was graduated from University College, Oxford; was elected for Devonport in the Liberal interest in 1865; was called to the bar in 1866, and in 1868 was elected M.P. for Hastings, which he represented until 1886. He became a civil lord of the Admiralty in 1880, and was secretary to the Admiralty in 1883–5. In 1895 he was appointed governor of Victoria, but retired early in 1900. He was founder and for a number of years editor of the *Naval Annual* and author of *Work and Wages* (1872), *British Seamen* (1877), *The Eastern Question* (1878), *Foreign Work and English Wages* (2nd ed. 1879), and *The British Navy* (5 vols., 1882–3). He was made K.C.B. in 1880 and baron in 1886. He was president of the Institute of Naval Architects in 1893–5.

Brassica, bras'i-*ka*, a genus of plants belonging to the Cruciferæ and including the numerous varieties of Mustard (q. v.), and of the Turnip, Rape, Cabbage, Cauliflower, Kale, and Kohlrabi (qq. v.).

Brassó, Transylvania. See KRONSTADT.

Brath'waite, RICHARD (1588–1673), English poet, was born in Westmoreland, and lived there and in London. He was a prolific writer. His best known work, *Barnabæ Itinerarium, or Barnabee's Journal* (1638), also known as *Drunken Barnaby's Four Journeys*, was published under the pseudonym of Corymbæus, and is a popular record of English travel in mixed English and Latin verse. His other works include pastorals like *The Poet's Willow* (1614), satires like *A Strappado for the Devil* (1615), threnodies like *Astræa's Tears* (1641), and novels like *The Arcadian Princess* (1635).

Bratianu, brä-ti-än', JON (1866–), Roumanian statesman, son of Jon C. Bratianu (q. v.). He was educated in Bucharest and in Paris, entered upon a political career, and became the leader of the Liberal party. He was premier of Roumania in 1907–10, 1914–18, December 1918–November 1919, and was again elected in January 1922. He was Roumanian delegate to the Paris Conference of 1919.

Died Nov 24 1927

Bratianu, JON CONSTANTIN (1822–91), Roumanian statesman, was born in Pitesti, and was educated in Paris, where he took an active part in the revolution of 1848. Returning to Bucharest, he made himself one of the leaders of the revolution in Wallachia in the same year, and was elected a member of the provisional government. In 1866 he took a prominent part in calling to the Roumanian throne Prince Charles of Hohenzollern. From that time he was the leading statesman in the country, being prime minister from 1876 to 1888, a period during which Roumania took part in the Russo-Turkish War of 1877–8, became independent of Turkey, and was raised to the status of a kingdom (1881). In 1878 Bratianu represented his country at the Congress of Berlin. During the period of his rule, also, a great number of administrative reforms were introduced in Roumania, railways were nationalized and developed, and schools and colleges were founded.

Bratsberg, bräts'berg, mountainous and picturesque county on the southern coast of Norway; area, 5,865 square miles. Fishing, forestry, and agriculture are the main occupations of the inhabitants. The chief town is Skien. Pop. 108,100.

Brattia. See BRAZZA.

Brattleboro, brat''l-bur-ō, village, Vermont, Windham county, on the Connecticut River, and on the Boston and Maine, and the Central Vermont Railroads; 7½ miles north of the Massachusetts boundary. The State Asylum for the Insane is situated here, and there is a public library. The beauty of the surrounding country is far famed, and the village is becoming a winter sports centre, having one of the finest ski jumps in the country. It is important in the maple sugar industry and produces furniture, pipe and cottage organs, toys, overalls, and finished granite. Pop. (1910) 6,517; (1920) 7,324.

Bratton. See BRACTON.

Braun, broun, AUGUST EMIL (1809–56), German archæologist, was born in Gotha, and died in Rome. He studied under Schelling and Gerhard, and became secretary to the Archæological Institute of Rome in 1833. His chief works are *Griechische Götterlehre* (1851–55), *Vorschule der Kunstmythologie* (1854; Eng. trans. 1856), and *Die Ruinen und Museen Roms* (1854; Eng. trans. 1855).

Braun, (KARL) FERDINAND (1850–1918), German physicist, was born in Fulda. He studied at different German universities, completed his education in Scotland, and occupied professorships successively at Marburg, Strassburg, Carlsruhe, and Tübingen, where he directed the construction of the Physical Institute. In 1895 he returned to Strassburg as professor of physics and director of the Physical Institute there. His studies were devoted for the most part to electricity, magnetism, and telegraphy. With the aid of Hartmann he constructed an ingenious apparatus for measuring the intensity of the magnetic field by means of a fine bismuth wire. In 1909 he shared with Marconi the Nobel Prize in Physics. In 1914 he visited the United States and was there at the time of his death, in 1918. His chief work was *Drahtlose Telegraphie durch Wasser und Luft* (1901).

Braun, LOUIS (1838–1916), German battle painter, was born in Württemberg. He studied with his brother Reinhold in Munich and later under Horace Vernet in Paris. He was official painter of the Franco-German war and made many striking pictures of that, as well as of the Danish and the Austro-Russian wars. Among his most famous paintings are *The Entry of the German Army into Paris*, *The Battle of Sedan*, *The Germans in Versailles*, and *The Market Place of Attigny*.

Braunsberg, brouns'ber*ch*, town, East Prussia, district of Königsburg on the Passarge River; 39 miles southwest of Königsberg. It is the seat of a Roman Catholic seminary, a gymnasium and the Lyceum Hosianum founded in 1564. There is an interesting church of the 14th century. Soap, linen, cotton, and leather are manufactured. Pop. 14,000.

Braunschweig, Germany. See BRUNSWICK.

Brauwer, ADRIAN. See BROUWER.

Brava, or BARAWA, seaport town, in Italian Somaliland, East Africa. Its trade is chiefly with India and Arabia. Pop. 5,000.

Brava, the southwesternmost of the Cape Verde Islands (q. v.). Pop. 10,000.

Brava, POINT, a cape northwest of St. Miguel Bay, Gulf of Panama.

Bravura, brä-vōō'rä (Ital.), a term applied to a style of musical composition or performance. It denotes florid brilliancy and technical dexterity.

Brawley, city, California, Imperial county, on the Southern Pacific Railroad; 100 miles east of San Diego. Pop. (1910) 881; (1920) 5,389.

Brawling, the common law offence of wilfully disturbing any meeting of persons lawfully assembled for religious worship, or of misusing any preacher, teacher, or persons so assembled. It is a misdemeanor, punishable by fine. The offence is now defined and regulated by statute in the United States generally. See Breach of the Peace; Assault.

Brawn (M. E. 'muscle,' 'boar's flesh'; akin to German *braten*, 'to roast'), a preparation of meat made from pig's head and ox feet, cut up, boiled, pickled, and pressed into a shape.

Brax'field, Robert Macqueen, Lord (1722–99), Scottish judge, was called to the bar in 1744, and gained the reputation of being the best feudal lawyer in Scotland. Raised to the bench in 1776, he became a lord of justiciary in 1780, and lord justice-clerk in 1788. His coarseness and cruelty on the bench won for him the names of the 'hanging judge' and the 'Jeffreys of Scotland.' An excellent study of him is given in R. L. Stevenson's *Weir of Hermiston.*

Brax'ton, Carter (1736–97), signer of the Declaration of Independence, was born in Newington, Va., and received his education at William and Mary College. A wealthy man, he nevertheless embraced the patriot cause at an early period; was a supporter in the Virginia House of Burgesses of Patrick Henry's Stamp Act resolutions (1765); and took an active part in the Williamsburg convention (1774). He was a member of the Virginia Committee of Safety; a delegate to the Continental Congress (1775–6); a member of the first Virginia House of Delegates under the Constitution, and a member of the Virginia Council of State.

Brax'y, Braksy, Braxes, Braxit, Bracks, or Braasot, a name applied loosely to various animal diseases, but more strictly to a disease of sheep, sometimes known simply as 'the sickness.' This disease is due to the ingestion of the *Bacillus gastromycosis ovis*, and is most prevalent in cold weather. The animals affected, usually from one to three years old, lose control over their limbs, are seized with convulsions, and die in from one to six hours after the appearance of the first symptoms of the disease. The majority of cases are found dead, but in the few which have been noticed during life, the following symptoms have been observed: loss of appetite, walking with an arched back, short steps, signs of pain, hurried breathing, swelling of the abdomen, then convulsions and death. Putrefaction sets in almost before death. After death the flesh appears of a dark-red color, and the veins are charged with dark blood, the bowels are found much inflamed and filled with gases, but there are no other special symptoms to indicate the disease. Adequate shelter from severe cold and rain are said to do much to prevent it. Vaccination with peritoneal fluid from diseased sheep has proven valuable.

Bray, town, Ireland, situated partly in the county of Dublin and partly in Wicklow; 12 miles southeast of Dublin. It is a favorite seaside resort, with fine scenery in the neighborhood. A good harbor has been constructed. Pop. 7,500.

Bray, district of Normandy, now the southeast part of Seine-Inférieure, famous for its cattle and dairy produce.

Bray, Anna Eliza Kempe (1790–1883), English novelist, was born in London. Of her novels, some are concerned with foreign life, others with the history of the great Devonshire and Cornwall families. Her best general work is her *Borders of the Tamar and Tavy.* She wrote also a *Life of Handel* (1857); *Revolt of the Protestants of the Cevennes* (1870); *Henry de Pomeroy* (1842); *Warleigh* (1836); *A Peep at the Pixies* (1854). Consult her *Autobiography* (1884).

Bray, Thomas (1656–1730), English divine and philanthropist, was born in Marton, Shropshire, England. From Oswestry School he passed to All Souls, Oxford, where he was graduated in 1678. In 1690 he was appointed to the rectory of Sheldon, where he wrote part of his *Catechetical Lectures,* which brought him a wide reputation. Soon after he was selected to act as the bishop of London's commissary in Maryland in the settlement of the church there. Not being able to start at once, he devoted himself to a scheme for establishing parochial libraries, and had such success that before his death eighty had been founded in England and thirty-nine in America. Out of his library scheme grew the Society for Promoting Christian Knowledge; and he may also be regarded as the founder of the Society for the Propagation of the Gospel. About the close of 1699 he sailed for Maryland, but in 1706 returned to England to accept the living of St. Botolph Without, Aldgate, London, where he labored with the utmost devotion.

Bray, Vicar of. Simon Aleyn was vicar of Bray, in Berkshire, England, from 1540 to 1588, during the reigns of Henry viii., Edward vi., Mary, and Elizabeth. He changed his faith three times, being twice a Papist and twice a Protestant, in order to adhere to his one principle, which was 'to live and die vicar of Bray.'

Bray'man, Mason (1813–95), American lawyer and soldier, was born in Buffalo, N. Y. He began life as a printer, and became editor of the Buffalo *Bulletin,* but turned to legal pursuits (1836), and lived in various towns in Michigan, Kentucky, and Illinois. In 1843 he was commissioned to inquire into the settlement of Mormons in the State of Illinois, and finally secured their removal (1844). During the Civil War he was chief of staff to M'Clernand, and rose to be brevet major-general. Subsequently he interested himself in railroad enterprises; edited *The Illinois State Journal;* was territorial governor of Idaho (1876–81); and a lawyer at Ripon, Wis.

Brazen Head, a mechanical contrivance which was fabulously reputed to possess the power of human speech, and to be capable of acting as a kind of oracle. Several are mentioned in the old necromancers and other books. One was made or owned by Pope Sylvester ii. (*c.*950–1003); another by Robert Grosseteste, bishop of Lincoln (1175–1253); another by Albertus Magnus (1193–1280); and another by Friar Bacon (1214–94), the most famous of all. The old folk tale of *Valentine and Orson* speaks of a large brazen head which acted as an oracle, and was kept in the castle of the giant Ferragus in Portugal.

Brazen Serpent, the figure which Moses set up before the Israelites, to heal those who had been poisoned by the serpents (Num. xxi. 9). It was destroyed by King Hezekiah after it had become an object of adoration (2 Kings xviii. 4).

Brazil, United States of, republic, South America, the largest state in South America and the third largest in the world, lies between latitude 4° 22′ n. and 33° 45′ s., and longitude 34° 40′ and 73° 15′ w. It is bounded on the north by Colombia, Venezuela, the Guianas, and the Atlantic Ocean; on the east by the Atlantic Ocean; on the south and west by Uruguay, Argentine Republic, Paraguay, Bolivia, Peru, Ecuador, and Colombia, bordering on every state in South America except Chile. The greatest length is 2,660 miles; the greatest breadth, 2,900 miles; and the area approximately 3,290,500 square miles. The most important harbors are Rio de Janeiro, Santos, and Bahia.

Topography. — Brazil is a triangular-shaped country, occupying the eastern angle of the continent. It lies almost wholly within the tropics, and is still in many parts unexplored and unsettled. On the north and west are the great depressions of the Amazon and Paraguay Rivers, which comprise large areas of flood plains and swamps, heavily wooded. The upper coast is bordered by low, alluvial bottom lands and sandy plains, full of lakes, and in places very sterile; while the southern angle of the country is rolling *campo* land, bordered by a low, sandy coast.

The interior of the country is a high plateau, with a general elevation of 1,000 to 3,000 feet, irregularly ridged by mountains and deeply cut by large rivers. The mountainous ranges of the maritime system form the eastern margin of this plateau, the easternmost of which is known as the Serra do Mar. This range plays an important part in the development of Brazil, for it is a costly barrier to communication with the interior, and turns nearly all the great rivers inland to find outlets through the distant Amazon and La Plata. To the west of the maritime system the elevated table lands of the Paraná and São Francisco make great baylike indentations in the northern and southern margins of the mountainous area, nearly uniting about the head waters of the latter. To the westward of these plains there is a second range, nearly parallel with the maritime system, constituting the mountains of Goyaz. To the westward of these come the great elevated plains of the Amazonian and Upper Paraguayan regions.

Brazil belongs, for the most part, to four drainage basins: (1) the Amazon (q.v.) in the north, which flows through the country for nearly 2,000 miles, and which, with its tributaries—including the Rio Negro, Madeira, Tocantins, and Tapajos — furnishes 3,000 miles of navigable waterways, and forms the largest river basin in the world; (2) the Rio Paranahyba, also in the north; (3) the Rio São Francisco in the east; and (4) the Paraná-Paraguay system in the south. Besides these, several shorter rivers discharge direct into the Atlantic —*e.g.*, the Jaguaribe, Grande do Belmonte, Doce, Itapicuru, Araguary, and Parahyba.

Large lakes, caused by the expansion of the rivers, are common in the Amazon basin. On the plateau they are also numerous; one of the largest (100 miles long by 25 broad) lies on the island of Bananal, in Goyaz.

Climate. — Brazil may be divided into three meteorological zones: (1) The Tropical Zone embraces the northern part of the country from 4° N. to 10° S., and has a mean temperature of 77° F. It is subdivided, according to humidity, into three regions: (*a*) the Upper Amazon, where the annual rainfall amounts to as much as 78 inches; (*b*) Matto Grosso and the interior of the states bordering on the Atlantic, with heavy rains in spring and summer, and an average rainfall of 46 inches; (*c*) the littoral, with rain in summer and autumn, and an average rainfall of 58 inches. (2) The Subtropical Zone extends from 10° to 23½° S. It has a mean temperature of 74° at Rio de Janeiro, and a rainfall of 44 inches between November and April. (3) The Temperate Zone extends from the Tropic of Capricorn to the southern boundary. It possesses a fine climate, with mean temperature of 63° F., and a rainfall, chiefly in winter and autumn, of 40 to 60 inches.

Geology.— No comprehensive study has been made of the geology of Brazil. The Acré territory and parts of Amazonas, Matto Grosso, and Goyaz are almost entirely unknown. Indications, however, show that the prevailing rocks throughout the country are of Archæan formation, and that Brazil is geologically one of the oldest parts of the South American continent. On the flank of the Archæan area are Palæozoic strata; while a large portion of the central plains are formed of Cretaceous and Triassic beds. Along the Amazon and in the coastal regions Quaternary and Tertiary formations are developed. The coastal ranges are composed of gneiss and granite (Laurentian system); Carboniferous limestones prevail from Santa Catharina to Rio Grande do Sul.

The most highly mineralized sections are the highlands of Minas Geraes. The richest soil is the famous red earth of São Paulo, a disintegrated trap. On the higher lands and second bottom lands is found a red clay, while the bottom lands have a rich black soil.

Flora. — The vegetation of Brazil is luxuriant and varied. The vast forests of the Amazon contain hundreds of species of trees, draped and festooned by climbing plants, lianas, orchids, etc. The flora of the lands subject to inundation comprises forests of myrtle, rubber trees, bombax, mimosa, cinchona, etc., dominated by palms. Creeping plants are rare, but the ground grows tough grasses. American willow, plantains, palms, and the *Arundo saccharoides* (16 to 20 feet high) are found on the banks of the streams. In the virgin forest beyond the reach of floods the trees are tall (200 feet and more), and the trunks are draped with lianas, bearing brilliantly colored flowers. The undergrowth consists of ferns and the phytelephas, yielding vegetable ivory. Along the Atlantic, from Pernambuco to Rio de Janeiro, mangroves and *conocarpos* grow. The *campos* are grass-covered plains, in the hollows of which grow cypresses and palms.

Other natural products include ten species of hevea (rubber), numerous fibre-producing plants, seven species of copaiba; carnauba, cocoanut, piassava, and other palms; maté, Brazil nut, cacao, vanilla, and sarsaparilla.

The flowers of the temperate zone are common, while distinctive plants are the passion flower (100 varieties), the orchid (1,059 varieties), the *Aristolochia gigantas*, a climbing plant with flowers a foot long, and the *Victoria regia*, along the Amazon.

Fauna. — As regards fauna, Brazil occupies almost the whole of a sub-region of the neotropical region which extends from Mexico to Tierra del Fuego, and contains nearly all its characteristic types. Over fifty varieties of monkey, eight species of bat, the jaguar, puma, ocelot, several species of wild dog, the anta or tapir (the largest mammal), the peccary, five species of deer, the capybara, agouti, sloth, ant-eater, and two species of armadillo are among the animals.

The birds are numerous (1,700 varieties) and of brilliant plumage. There are 59 species of humming birds, 26 of Tanagridæ, and 65 of woodpeckers; while other birds are the flamingo, emeu, rhea, heron, stork, parrot, and macaw. Goatsuckers and the American ostrich belong to this region.

There are 180 varieties of snakes, of which 20 are venomous. They include the boa constrictor, bushmaster, rattlesnake, python, and anaconda. Alligators, turtles, porpoises, and manatees swarm in the Amazon. Insects are innumerable.

Forestry. — Brazil has vast forest regions, that of the Amazon alone covering over 2,000,000 square miles; and it has an abundance of valuable woods, as pine, cedar, mahogany, and ebony. The forests have been exploited for many years, and the Agronomical Institute of the Botanical Gardens distributes large numbers of saplings for the purpose of reforestation. There are several hundred lumber mills in the country. The railroad companies and sugar mills use native woods for ties and fuel. Approximately 90 per cent. of the large number of safety matches made in Brazil are manufactured from the Paraná pine.

Fisheries. — The waters of Brazil abound in fish of all kinds, Agassiz having discovered over 2,000 varieties in the Amazon alone; but up to 1912 no attempt had been made to modernize and extend the fishing industry. In that year the government established a fisheries inspection service, with 3 marine biological stations, and with practical schools. There are 13 whaling stations on the coast of Bahia. Fifty boats and 900 men are engaged in the industry.

Mining. — Comparatively little has been done to exploit the Brazilian mines. Minas Geraes and Bahia are the chief mining regions, yielding diamonds, gold, iron, manganese, and monazite. Gold is mined in Minas Geraes and is found in many other states. The principal mines are Morro Velho, worked since 1830, and Passagem. Coal suitable for briquets is found in Santa Catharina, São Paulo, and Rio Grande do Sul. Diamonds occur in Goyaz, São Paulo, Paraná, Bahia, Matto Grosso, and Minas Geraes. Manganese ores are found in Minas Geraes, Bahia and Rio de Janeiro, and iron occurs abundantly in Minas Geraes.

A large part of the monazite sand of the world comes from Brazil, and other mineral exports are copper ore, mica and talc, rock crystal, agate, and platinum, but these are not found in large quantities. Among the valuable stones, besides diamonds and agates, are marble, topaz, amethyst, garnet, aquamarine, ruby, tourmaline, and blue sapphire. Petroleum in workable quantities has been discovered, and there are some lignite and peat. There are famous sulphur springs at Araxa in Minas Geraes.

Irrigation. — The extreme northeast, between 2° and 7° s., the only section of the country that needs irrigation, is being surveyed, and storage dams, reservoirs, and artesian wells are under construction. The Oros reservoir in Ceará is said to be the largest in the world. A new inspection service maintains gauging stations on 33 rivers.

Agriculture. — Agriculture, which is encouraged by the state governments, is the principal occupation of the people, and agricultural products form the major part of the exports. On the Upper Amazon the chief occupation is the collection of india rubber, mostly wild. The world obtains its best rubber, the Para variety, from Brazil, the annual crop amounting to more than 25,000 tons. In the Atlantic states, farming is most developed. Coffee, the chief product, occupies about 5,500,000 acres, the chief districts being the states of São Paulo, Rio de Janeiro, Espirito Santo, and Minas Geraes, which comprise, together, about one-eighth of Brazil. Four-fifths of the world's supply of coffee comes from this region, more than one-half the coffee of the world coming from São Paulo alone. The annual crop is approximately 12,000,000 sacks (132 lbs. each) Cacao, indigenous in the Amazon Valley, is cultivated as far south as the northern part of Espirito Santo. Bahia, with some 40,000,000 trees, produces 80 per cent. of the Brazilian crop, though the best quality comes from Maranhão. With an annual output of nearly 60,000 tons, Brazil ranks next to the Gold Coast of Africa among the countries of the world in the production of this commodity.

Sugar is grown principally in the northeast, and in Rio de Janeiro and São Paulo, the average annual output, under prevailing methods, being nearly 800,000 tons. The great tobacco state is Bahia. Cotton thrives in nearly all the states except in the Amazon Valley and the extreme south; the 1924–5 production was 131,000 tons. Maté, or yerba maté (Paraguayan tea), is grown chiefly in Paraná.

Successful experiments in wheat cultivation have been made, chiefly in Rio Grande do Sul, where the annual crop increased, in a recent five-year period, from 15,000 tons to 70,000 tons. Rice is grown in 15 varieties; but it is only within the last twenty years that scientific methods of cultivation have been attempted, the greatest progress having been made in the southern states, particularly São Paulo and Rio Grande do Sul. In these states the average yield per acre was 50 per cent. greater than in other parts of Brazil. São Paulo produces annually about 4,000,000 tons of corn. Beans, peas, sweet potatoes, and lentils are extensively cultivated for home consumption. Tropical fruits are abundant. The mulberry finds favorable conditions, and plantations are subsidized by the government, which also maintains sericulture experimental stations. The vine flourishes in the São Francisco Valley, and the native wines are of good quality.

The Federal Department of Agriculture was established in 1907; and the scientific methods which it promotes have made much progress in São Paulo, Minas Geraes, Rio de Janeiro, Rio Grande do Sul, Paraná, and Santa Catharina.

Stock Raising. — The vast plains furnish excellent facilities for stock raising, and rapid strides are being made in this industry. The Federal and state governments, as well as private corporations, have expended large sums of money in order to improve the stock in the states which are most suited to the industry — Rio Grande do Sul, Matto Grosso, Paraná, Santa Catharina, Piauhy, Goyaz, Minas Geraes, Rio de Janeiro, São Paulo, Bahia, and Ceará. The native cattle are small, weighing about 400 pounds when dressed, but the size is being increased by cross breeding with imported stock from Texas, Belgium, England, and Switzerland. The stock of horses is being successfully improved by the importation of blooded strains, especially Arabian. Mules and asses, which do much of the carrying trade, are imported in large numbers from the Argentine Republic. Pigs are bred in Rio Grande do Sul, São Paulo, Minas Geraes, Santa Catharina, Goyaz, and Rio de Janeiro.

An agricultural census (1920) showed that there were in the republic 34,271,324 cattle; 16,168,549 swine; 7,933,437 sheep; 5,086,655 goats; 5,253,699 horses; and 1,865,259 mules. There are zoötechnic stations, model stud farms, and a veterinary inspection service.

Manufactures. — The manufacturing industry is largely confined to the states of Rio de Janeiro, Bahia, São Paulo, and Rio Grande do Sul, and to the Federal District. Brazil has 19,734 factories (1920), with 350,000 employees, a total capital of $500,000,000, and an annual output valued at $750,000,000.

The textile industry is the most important manufacturing industry. In 1921 cotton factories numbered 242 and workers 108,960, capital amounted to more than $80,000,000, and products were valued at $100,000,000. About 200,000 yards of cotton cloth are produced annually. Woollen cloth, flannels, rugs, and felts are also manufactured, and the silk industry is encouraged by the government.

The manufacture of sugar is also an important industry; there are about 200 establishments in the country, distributed in Campos (Rio), Pernambuco, Bahia, and other localities. Other industries are the preparation and manufacture of hides and leather, shoes, of which about 20 million pairs are produced; hats; matches, of which some 28,800,000,000 are made every year; tobacco, over 2,000 factories employed; rubber; flour; paper; furniture; lumber; live stock and meat packing, of which there were 15 establishments in 1922 with a capital of 187,000,000 milreis; and brewing, distilling and the bottling of domestic mineral waters.

Commerce. — Brazil carries on a very large commerce. The total imports in 1925 were valued at $406,162,136, and the exports at $483,758,118. The amount and value of the leading exports for that year were as follows (all quantities are in metric tons, 2204.6 lbs. except for coffee): coffee, 13,482,000 sacks, $348,-

820,282; rubber, 21,578 tons, $21,471,889; tobacco, 34,178 tons $10,539,246; sugar, 3,182 tons, $271,616; yerba maté (Paraguayan tea), 86,755 tons, $12,930,903; cacao, 64,525 tons, $12,005,074; hides, 56,046 tons, $14,176,226; chilled beef, 57,077 tons, $8,459,716.

The principal countries participating in Brazil's trade in 1925 were: United States, imports, $100,820,543, exports, $218,168,992; United Kingdom, imports $90,332,451, exports, $24,175,366; France, imports, $23,560,259, exports, $61,534,880; Argentine Republic, imports, $47,600,793, exports, $25,806,952; Germany, imports, $56,026,461, exports, $32,728,169; Italy, imports, $14,792,157, exports, $30,516,478.

Extensive port improvements have been made at the principal ports. The merchant marine consists of 541 steamers with a net tonnage of 323,927. During 1924, 9,519 steam vessels, with a tonnage of 32,909,181, entered the ports of Brazil. There is steamer connection with the United States, the principal European countries, and Japan.

Communications.—Brazil was the first country in South America to have a steam railway, the concession for the first line being granted in 1852. On Jan. 1, 1924, there were 18,822 miles of railway in operation, of which 10,994 were owned and controlled by the government. The entire system connects the railways of Brazil, Argentine, Paraguay, and Uruguay. Most of the lines are owned either by the government, or by the states. They are principally in the coastal states of Rio de Janeiro, São Paulo, and Minas Geraes.

The most important railways are the Central (owned by the government), from Rio de Janeito to Minas Geraes and São Paulo (1,563 miles); the Mogyana, in Minas Geraes and São Paulo (910 miles); the Sorocabana, in São Paulo (813 miles, to be extended to reach the Bolivian frontier); the Paulista, in São Paulo (690 miles), which is electrified from Jundeahy to Tatú; the São Paulo-Rio Grande, in Paraná and Santa Catharina (2,000 miles open). A railway is also being constructed for a length of 210 miles (100 miles open) round the cataracts and rapids of the Madeira and Mamore Rivers from Porto Velo to Guajara Mirim.

One of the most notable achievements has been the connecting of São Paulo with the southern states of Paraná, Santa Catharina, and Rio Grande do Sul, by a system of railways which places Grande do Sul in direct communication with Rio de Janeiro. From the southern point, Uruguay can be entered overland across its northwestern border. From São Paulo, again, surveys have been made westward to the frontier of Paraguay; and in harmony with these extensions is a project to enter Argentine over the Rio de la Plata. Other lines are in course of construction or extension.

The chief means of communication with the interior are the navigable rivers, with a total length of some 40,000 miles, of which more than half is in actual use, through the work of some score of navigation companies. Two great highways are projected for Northern Brazil.

In 1920 there were 3,696 post offices, which handled some 12,000,000 pieces of mail. A postal savings bank was established in 1910, and parcel post treaties have been entered into with the United States, Great Britain, Germany, Austria, Italy, and several other nations. The Government controls the telegraph system, which, in 1919, had 54,526 miles of line and 850 offices, and dealt with 5,350,600 messages. There are telephone lines in Rio de Janeiro, São Paulo, Bahia, and Rio Grande do Sul. The government has five radio-telegraphic stations along the coast, and 15 in the interior, and there is cable connection with the United States and Europe. A wireless system is now (1927) in process of completion.

Finance.—In 1926, the revenue was estimated at 121,646,000 gold milreis, and the expenditure at 83,413,000 gold milreis. The consolidated foreign debt (Dec. 31, 1924) was £102,623,294, 336,206,500 francs, and $67,050,500.

The monetary unit is the gold *milreis*, which is worth $0.546 in American money; the paper *milreis* is worth about 32 cents. The *milreis* is divided into 1,000 parts, called *reis*. Silver (500, 1,000, and 2,000 reis) and gold (5, 10, and 20 milreis) coins are issued. Congress recently authorized the mintage of nickel coins of 20, 50, 100, 200, and 400 *reis*, and the retirement of bronze coins of 10, 20, and 40 *reis*. Paper money is circulated of the values of 1, 2, 5, 10, 20, 50, 100, 200, 500, and 1,000 *milreis*. By recent law, a new gold coin was issued valued at about $5, and a new silver coin equal to 1/25 of the value of the gold coin. The metric system is used in all official departments, but the ancient measures are employed to some extent in rural districts in the interior.

Population.—The statistics of population are unsatisfactory at best. Three official censuses have been taken, in 1872, in 1900, and in 1920. An estimate of the total population (1923) was 33,767,342. The table which follows is the 1923 estimate according to states.

STATES	Population
Federal District	1,260,498
Minas Geraes	6,401,923
São Paulo	5,169,945
Bahia	3,601,094
Rio Grande do Sul	2,433,467
Pernambuco	2,387,024
Rio de Janeiro	1,703,370
Ceará	1,421,514
Alagoas	1,049,256
Pará	1,124,849
Maranhão	961,430
Parahyba	1,077,025
Sergipe	501,266
Paraná	777,352
Piauhy	674,159
Amazonas	386,957
Santa Catharina	757,615
Espirito Santo	521,757
Goyaz	575,994
Rio Grande de Norte	601,930
Matto Grosso	279,419
Acré Territory	99,498
Total	33,767,342

The estimated population of the principal cities on Jan. 1, 1923, was: Rio de Janeiro, 1,442,000; São Paulo, 579,033; Bahia, 283,422; Recife, 238,843; Pará, 236,402; Porto Alegre, 179,263; Manáos, 75,704.

The most densely populated parts are the coastal regions and the adjoining valleys, together with some districts in the interior of Minas Geraes and the southern states. The population is mixed, the approximate proportions being, Europeans, 45 per cent.; Indian half breeds, 32 per cent.; negroes, 15 per cent.; pure Indians, 8 per cent.

Immigration has brought Portuguese, Spaniards, Italians, Poles, French, and other European races, and, for some years past, Japanese (averaging about 10,000 a year). In the southern states of Paraná, Santa Catharina, and Rio Grande do Sul there exist numerous colonies of Germans, amounting, in normal times, to nearly half a million persons in all. There are about an equal number of Italians scattered over Southern Brazil. The government has encouraged immigration by granting lands, and by forming immigrant colonies, of which there were 19 on Dec. 31, 1921, with total population of 44,459. There is an immigrant aid station at Rio de Janeiro. The number of immigrants received during 1924 was 98,125, as compared with 86,967 in 1923.

An Indian Protection Service was formed in 1910. The principal tribes are the Caribs, Arawaks, Gessan (savages), and Tupi-Guarani.

Religion.—The Roman Catholic was the established religion under the empire; under the republic there is no state church, and all sects are tolerated. Except for some 100,000, however, all the people are Catholics. The Roman Catholic hierarchy includes a cardinal at Rio de Janeiro, archbishops at Bahia, Rio de Janeiro, São Paulo, Pará, and Mariana (Minas), and 44 suffragan bishops. Twenty seminaries furnish instruction to the clergy.

Education.—Up to 1911 each state had entire control of its own school system; but a decree issued in that year placed all elementary schools, and such higher institutions as secured subsidies, under the control of the Federal Board of Education. Institutions of higher learning are maintained by some states, and by private associations. Education is free, but not compulsory except in some states. There are 450 secondary schools, with 48,000 enrollment, 76 colleges granting teachers' diplomas, and some 22,000 primary schools attended by approximately 1,250,000 pupils. Many schools formerly gave degrees, but in 1911 that privilege was restricted to the colleges. Brazil has one official university in Rio de Janeiro, there are two private universities, at Manãos and Curityba, and degrees are conferred by 56 faculties. In Rio de Janeiro there are a military college, a naval school, a preparatory school of tactics and a school of aviation. The language is Portuguese, with dialectal varieties.

The Federal Government has in the capital a National Institute of Music and a School of Arts, as well as a school for the blind and the deaf. There are many public libraries; the National Library, in Rio, possesses over 400,000 books and manuscripts.

Much attention has been given to agricultural education, which is provided in the Superior School of Agriculture, in Rio (established 1913), and in four other agricultural schools. There are also various model farms, dairy schools, breeding stations, and other institutions devoted to agricultural pursuits. Industry and commerce are represented by 97 industrial schools and 48 commercial schools, respectively. Accurate statistics are not available but it is estimated that from 60 to 80 per cent. of the population is illiterate.

Army and Navy. — Military service is compulsory for all males between the ages of twenty-one and forty-four—1 year in the ranks, 8 years in the first reserve, 7 years in the territorial army, and 7 years in the National Guard. The peace strength of the army is 45,000; there are 500,000 men in the reserve; while another 500,000 are available. There is a balloon and aeroplane section. A decree of Dec. 27, 1917, empowered the President to revise the Compulsory Service Act (1908), especially as regards: the principal of a national army, rather than a professional; the provision of first and second line armies, with their respective reserves; the setting of age limits for the first and second lines; and simplification of enlistment and drafting regulations. A decree of May 30, 1918, provided for incorporating the National Guard as part of the regular army, to constitute the second line, and to be responsible to the ministry of war, with the rest of the army.

The Brazilian navy consists of 2 dreadnoughts (*São Paulo*, and *Minas Geraes*), 3 protected cruisers, 1 coast-defence ship, 2 torpedo gunboats, 1 river monitor, 11 Yarrow destroyers, 3 submarines, a submarine salvage vessel, and a mine ship, besides school ships and transports.

Government.—Under the empire the government of Brazil was a constitutional monarchy. At the revolution of 1889 the empire became a republic, and in 1891 the present constitution was proclaimed by a national congress convoked by the provisional government. The United States of Brazil are a federative republic, each of the old provinces and the Federal District forming an organized state administering its own affairs at its own expense, and having distinct administrative, legislative, and judicial bodies. But the Federal Government takes charge of national defence, public order, and federal law, as well as customs, stamps, postal arrangements, and the issue of bank notes. The Republic consists of 20 states, a Federal District, and the Federal territory of Acré.

The national congress, the legislative authority, consists of a Chamber of Deputies and a Senate, which meet annually; and the president's sanction is required to new laws. Deputies and senators both receive salaries, and neither can serve as minister of state. Deputies who must have been citizens of the Republic for four years, are elected by the direct vote of the several states for three years, in the proportion of not more than one to 70,000 of the population. Senators, of whom there are 63, are chosen by direct vote, three for each state, and three for the Federal district, for a term of nine years.

The President has supreme command of army and navy; has power to declare war and make peace, within certain defined limits; appoints and dismisses ministers, and, with the assent of Congress, appoints ambassadors and the judges of the Supreme Federal Court. He must be a native Brazilian, over thirty-five years of age, and must not be related by blood or marriage, in first or second degree, to the preceding president. The President serves for four years, and cannot serve two successive terms. Dr. Washington Luiz de Souza was elected March 1, 1926, succeeding Dr. Arturo da Silva Bernardes.

The Cabinet consists of the Ministers of Foreign Affairs, Justice, Interior and Public Works, Agriculture, and Industry and Commerce. There is a Supreme Court of 15 members.

All male citizens of twenty-one years, duly enrolled, exercise the franchise, except illiterates, beggars, soldiers in service, and monastics under vows.

The national capital is Rio de Janeiro, in the Federal District. Administration of the District is vested in a council elected by District citizens, executive power being exercised by a Prefect, whom the President appoints to hold office for four years.

History.—As early as 1480, expeditions sailed from Bristol in search of the island of Brasylle, rumored to exist in the western seas; Brazil was discovered on Jan. 26, 1500, by Vincente Yañez Pinzon, who landed at Cape St. Augustine, near Pernambuco, and then followed the coast north to the Orinoco. In the same year a Portuguese expedition to the East Indies, under Pedro Alvarez Cabral, discovered the Brazilian coast near Porto Seguro. Cabral took formal possession, and named his new discovery 'Terra da Vera Cruz.' Two Portuguese expeditions were sent out in 1501 and 1503, the first exploring the coast from 5° to 32° s. lat., and the second planting a colony and bringing back a rich cargo of Brazil-wood, which gave this name to Portugal's new possession.

In 1530 the Portuguese government resolved upon the definite settlement of Brazil. Many of the earliest colonies failed through lack of means, and from inability to hold their ground against the natives. In 1567 a Huguenot colony, established on the bay of Rio de Janeiro twelve years before, was overthrown by the Portuguese, who then founded the present capital of Brazil.

The first governor-general was appointed in 1549, and with him came six Jesuits, including Father Nobrega, 'the Apostle of Brazil,' who rendered important service in the first settlement and in the extension of colonization. From 1578 to 1640 Brazil, with Portugal, was under Spanish rule, with Bahia as the capital. The Dutch in the early seventeenth century succeeded in gaining control of the northern part of the country; and the Dutch-Portuguese alliance of 1641 delimited their respective territories. The Dutch colonists were driven out by the Portuguese in 1654, however; and by a treaty concluded in 1661, the Netherlands gave up all claim to Brazilian territory in consideration of the payment by Portugal of 8,000,000 florins.

The discovery of gold in Minas Geraes in 1693, and of diamonds in 1729, gave a new impetus to the growth of the country, one result of which was the removal of the colonial capital from Bahia to Rio de Janeiro. The cultivation of cotton, tobacco, and sugar-cane had already brought the land favorable notice and much prosperity. In the early nineteenth century Brazil is said to have contained 12 cities and 66 towns, and a total population of over 2,500,000. All manufactures except sugar were forbidden, and the ports were closed to foreign commerce.

In 1808 the royal family of Portugal was expelled by the French and took refuge in Brazil, and the first act of Dom João VI. was to open Brazilian ports to foreign commerce. He then removed various restrictions on domestic industries, founded a printing office and library, created new courts, and opened various schools and public institutions. All these acts greatly stimulated the growth of the country. In 1821 he returned to Portugal, leaving his eldest son in Brazil as prince-regent.

Personal ambition, and the advice of men opposed to government from Lisbon, led the young prince to declare for Brazilian independence (Sept. 7, 1822). He was proclaimed and crowned emperor—as Dom Pedro I., and before the end of the year the small Portuguese force in the country was quickly and easily expelled. The constitution was ratified and sworn to early in 1825, and some amendments were added in 1835.

The new empire, however, did not start smoothly, nor was the reign of Dom Pedro I. a fortunate one. Vexed with the opposition encountered, he voluntarily abdicated in 1831 in favor of his eldest son, and withdrew to Portugal. During the next nine years Brazil was governed by regencies, but in 1840 a popular agitation led to the declaration of the young prince's majority, at fifteen years of age, and to his coronation the following year as Dom Pedro II. The reign was generally peaceful, although disturbed by two wars—one with Buenos Aires in 1852, and the other with Paraguay in 1856–70.

In 1851 the slave trade, inaugurated as early as 1530, was abolished. In 1871 infants born of slave mothers, and in 1885 all slaves over sixty years of age, were declared free. In 1888 an emancipation proclamation liberated all slaves within the empire, but failed to provide compensation for their owners. This act alienated the aristocratic slave-holding class, and hastened the revolution of November, 1889, by which the empire became a republic. Dom Pedro II. yielded to the will of the people, allowing himself to be dismissed from the country. He died in 1891.

The republican form of government was inaugurated on Nov. 15, 1889, and a new constitution was adopted in 1891. General Fonseca became the first president of the new republic; but two years later, when he dismissed Congress and assumed the *rôle* of dictator, he, too, was overthrown. The government for several years was occupied in suppressing revolt; but public confidence was restored by the wise and strong administration of President Moraes, and no serious trouble has been experienced since 1893.

Boundary adjustments have been made with Argentine (1895), French Guiana (1900), Bolivia (1902), British Guiana (1904), Ecuador (1904), Dutch Guiana (1906), Colombia (1907), Peru (1909), Uruguay (1913), Chile (1913), Colombia and Peru (1925); and the frontiers agreed upon have been delimited. The Acré Territory was acquired by the Bolivian treaty. In 1909 it presented a petition for statehood. Greenwich time and longitude were adopted in 1913. In that year the country was visited by P. C. Knox, U. S. Secretary of State; and in May, 1913, the visit was officially returned by the Brazilian Foreign Minister, L. S. Müller (q.v.).

The public health service has been placed on a high plane of efficiency, and the coast towns and parts of the interior have been freed from endemic diseases.

In 1914 ex-President Roosevelt headed a scientific expedition which carried on important explorations in the heart of Brazil (see ROOSEVELT, THEODORE). That year also was somewhat disturbed by serious uprisings in some of the states, including Ceará, Pernambuco, and Pará, the trouble being largely racial in the north, where there is a considerable negro population.

The outbreak of the Great War (1914) had a disastrous effect on national finances, so great had been the value of German imports. The normal flow of immigration was greatly reduced and transportation facilities could not be expanded owing to the impossibility of obtaining steel rails and rolling stock. Brazil remained neutral for more than three years but the sinking of Brazilian ships under Germany's policy of unrestricted submarine warfare at length led to a declaration of war against Germany, October 26, 1917. A Brazilian naval squadron was sent to European waters and many Brazilian aviators joined the Allied forces. In 1922 Brazil celebrated the centennial of her independence by an international exposition in Rio de Janeiro at which the leading countries of the world were represented by delegations. The years 1922 and 1924 were disturbed by unfortunate military revolts and periods of lawlessness and anarchy which were at length suppressed by the Federal forces. In 1926 Brazil resigned her membership in the League of Nations, the reason of her action being her refusal to acquiesce in a permanent seat on the Council for Germany unless she herself was allotted one

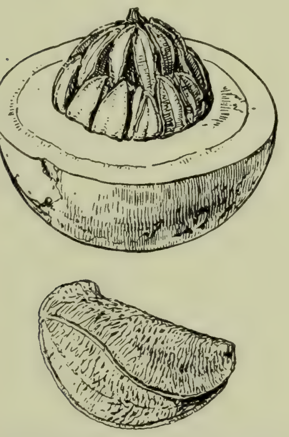
Bibliography.—Consult Aker's *History of South Ameriac, 1854 to 1904;* Dawson's *The South American Republics* (2 vols.); Martin's *Through Five Republics of South America;* Wright's *The New Brazil;* Nabuco's *Spirit of Nationality in the History of Brazil;* Dodd's *Modern Constitutions* (1909); Roméro and Ribeiro's *Compendio de Historia da Literatura Brasileira;* Domville-Fife's *The United States of Brazil* (1910); Cook's *Through the Wilderness of Brazil* (1910); Gammon's *The Evangelical Invasion of Brazil* (1910); Winter's *Brazil and Her People of To-Day* (1910); Denis' *Brazil* (1911); Porter's *The Ten Republics of South America* (1911); Clémenceau's *South America of To-Day* (1911); Currier's *Lands of the Southern Cross* (1911); Kerbey's *An American Consul in Amazonia* (1911); Bryce's *South America* (1912); Ray's *Brazilian Sketches* (1912); Lange's *In the Amazon Jungle;* Roosevelt's *Through the Brazilian Wilderness* (1914); Bruce's *Brazil and the Brizilians* (1915); James' *Brazil After a Century of Independence* (1925); Pan-American Union's *Bulletins* (to date).

Brazil, city, Ind., co. seat of Clay co., 56 m. w.s.w. of Indianapolis, on the Chi. and E. Ill., the Evansville and Terre Haute System and other R. Rs. The city has a public library. There are extensive mines of block coal in the region, and vast deposits of clay and sedimentary rock. Coal mining and the manufacture of pig iron are the chief industries. Engines, steel rails and structural shapes, boilers, brick, sewer-pipe, and kindred products are also manufactured. Pop.(1910) 9,340.

Brazil Cabbage. An araceous plant (*Caladium* [*Xanthosma*] *sagittifolium*) native to the West Indies. It is cultivated in many tropical countries for the sake of its rhizome; this is an important food, as it contains much starch; the foliage, also, serves as a 'pot-herb.'

Brazilian Grass. Strips from the leaves of a West Indian fan-palm (*Chamærops argentea*); exported chiefly from Cuba, and woven into cheap chip hats.

Brazil Nut, the seed of *Bertholletia excelsa*, a tree belonging to the Myrtaceæ, indigenous to Brazil, Guiana, and Venezuela, where it attains a height of 100 ft. or more. The fruit is a hard, hollow shell, nearly spherical, and about six inches in diameter. These fruits are borne in large numbers on the upper branches of the tree; when ripe they fall off, open by the removal of a small lid, and expose from twelve to twenty-two nuts. The nuts are ridged and angular, owing to the way in which they are packed in the fruit, and contain within the hard shells a pleasantly flavored, edible, white kernel from which an oil is pressed for burning.


Brazil Nut, Fruit (*cut open*), *and single Nut.*

A better quality of Brazil nuts are those called Sapucaia nuts, the seeds of the monkey-pot tree (*Lecythis Ollaria*), also enclosed in a hard pincarp, pot-shaped, which has a lid that drops off when ripe, letting the oblong, grooved nuts escape. They are rarely seen in the markets, although considered better than ordinary Brazil nuts.

Brazil-wood is the name given to a number of red-dye-yielding woods growing in Brazil, the W. Indies, and Japan. They were at one time largely employed in dyeing, but have now been replaced by aniline colors. Several species of the leguminous genus Cæsalpinia produce this dye-wood, which is yellowish when freshly cut, becoming red upon exposure. *C. Brasiliensis* furnishes, in its heartwood, much of the Brazil-wood; *C. echinata* yields Pernambuco wood, while *C. sappan* gives sappan-wood. Brazil-wood is generally sent to market in the form of sawdust.

Brazing is a form of soldering by means of a kind of brass called spelter. The surfaces to be united are thoroughly cleaned, and heated by a forge or a blow-pipe, spelter being applied to the joint in the form of wire or filings, along with borax, which acts as a flux.

Brazos, one of the largest rivers of Texas. It rises in the Llano Estacado, in the w. part of the state, and flows in a general s.e. course to its mouth in the Gulf of Mexico. Length, 900 m.; navigable at high water for 300 m.

Brazza, the mediæval *Brattia* (Slav. *Brac*), isl. of Austria, Dalmatia; lies between the island of Lesina and the Dalmatian coast, s. of Spalato. The surface is hilly, reaching 2,580 ft. in Mt. San Vito. The principal products are fruits, such as olives, almonds, figs, and excellent wine. It also yields good marble. Area, 153 sq. m. Pop. (1900) 24,465. Chief town, San Pietro (pop., 1900, 3,329), on the n. coast. The port of Milna (pop., 1900, 4,681) is on the s. coast.

Brazza, PIERRE PAUL FRANÇOIS CAMILLE, COMTE DE (1852–1905), whose real name is BRAZZA-SAVORGNAN, African explorer, of Italian parentage, was born on board a vessel in the harbor of Rio de Janeiro, and educated at the Jesuits' College at Paris and the Naval School at Brest. In 1874 he was naturalized a Frenchman, and having entered (1870) the marine service, was sent in 1875 to explore the Ogowe R., in W. Africa. He followed (1876–8) the course of the river for 430 m., and proved the practicability of penetrating into Central Africa by way of the two water-courses of the Ogowe and the Alima. In 1879–80 he again explored the same region, and set up two important scientific stations, Franceville and Brazzaville (n. shore Stanley Pool), and twenty-five other posts, establishing France's claim to the territory about Stanley Pool before that explorer had appeared there. He returned to Europe in 1882, and the following year was dispatched by the French government to complete his exploration of the Ogowe, to determine the basin of the Alima, and to conciliate the natives. In 1886 he became commissary-general of the French settlements in W. Africa, in 1888 governor-general of French Congo, and in 1891 he explored the Sangha. Ill-health compelled him to retire in 1897. In 1902 he was awarded a pension of 10,000 francs by the Senate. In February, 1905, he was appointed by the French government to investigate the charges of cruelty against natives in the French Congo region, and in the following September it was announced that two colonial officers had been sentenced to five years imprisonment as the result of De Brazza's recommendations. Other similar sentences followed, and De Brazza was still at work formulating his report when he was taken ill at Dakar, in the colony of Senegal, where he died. See Bréard's *Les Voyages de Savorgnan de Brazza* (1884).

Breaching Tower, a structure which played an important part in the siege of mediæval castles. In its original form it was a long wooden shed fixed on a wheeled framework, the roof being of great strength. From the roof hung a battering-ram, which could thus be swung to and fro against the base of the castle wall without the workers being exposed to the fire from the battlements above. See BELFRY.

Breach of Contract. The failure to perform any material term of a contract, subjecting the defaulting party to an action for the damages sustained by the breach. In cases where the performance of a contract by one party is a condition of its performance by the other, a breach by the former relieves the latter from his obligation. In certain classes of cases, as in contracts for the conveyance of land, a breach by either party entitles the other to a decree in equity requiring the party in default to make specific performance of the contract on his part. See CONTRACT, SPECIFIC PERFORMANCE.

Breach of the Peace. Any violation of public order. The reign of law and order is the King's peace, or, in the U. S., the peace of the people of the state. Any act by which that order is disturbed is a breach of the peace. The term is not applied to any specific offence, but indictments for crime always state that the offence charged is against the peace of the King or of the people. In popular language, the term is generally confined to assaults, affrays, riots, and other acts of violence. A person who sees a breach of the peace being committed is entitled to arrest the offender, and any one threatening to commit an assault or other crime of violence may be arrested and bound over to 'keep the peace.'

Breach of Promise OF MARRIAGE. The refusal of a man or woman to perform a contract of marriage. Such refusal is ground for an action for damages. It is a good defence to such an action that the defendant is an infant, or if the plaintiff is a woman, that she is unchaste, or that the plaintiff induced the promise by material misrepresentation. But a plaintiff need not disclose facts prejudicial to himself or herself—*e.g.* that he or she is a lunatic. Ill-health, or an already existing marriage, if the plaintiff is unaware of it, is no defence. A contract to marry must be carried out within a reasonable time. See MARRIAGE.

Breach of Trust. See TRUSTS.

Bread. Cereals have always been a staple food for the human race, and bread is the most satisfactory form in which they can be used, all things considered. Wheat, rye, corn (maize) and oats are most generally used for breadmaking, and less commonly, barley, buckwheat, rice, etc. Grain is usually prepared for breadmaking by cleaning, crushing, and bolting to obtain a fine, soft powder called flour or meal, which is made into dough with water or milk, or both, and baked. Salt is usually added to the dough, and frequently a little sugar and lard or butter. If no yeast or other leavening agent is mixed with the dough, unfermented bread results, and to make up for the lack of porous structure, unfermented bread is usually baked in flat, thin cakes. The passover bread of the Jews and hardtack or pilot bread are common forms of unleavened bread. In making fermented bread, sour dough or leaven and yeast are the common leavening agents. Leaven is simply dough, or a mixture of flour which is in a state of fermentation; that is, which contains a large number of active yeast plants, or similar micro-organisms. Ordinarily yeast contains an abundance of the yeast plant growing in a satisfactory culture medium and in a convenient form for mixing with dough. For commercial purposes, the fluid is often thickened with flour or similar material and made into small cakes, so that it may be transported and handled more conveniently than the liquid yeast. The proportion of water required to mix with flour and yeast to form the bread sponge depends on the quality of the flour, or more specifically, upon the amount and character of gluten present, but enough should be added to make the sponge as moist as can be moulded readily with the hands. The dough should be thoroughly kneaded so that the yeast will penetrate every part of the mass, and should then be allowed to stand in a warm place, for some warmth is an essential condition to the fermenting process. The most favorable temperature is 70° to 75° F. When the yeast plant grows in the bread sponge, it acts first upon the starch of the flour, changing it into sugar, and then decomposes the sugar into carbon dioxide and alcohol, and it is not until the latter stage is reached and gas begins to form that the action is noticeable. After a time the whole mass of the dough is honey-combed with bubbles of gas, and it is usually kneaded a second time to break up the larger bubbles into many small ones and distribute them evenly through the mass of the dough. The thoroughly kneaded mass is next moulded in loaves and is again allowed to rise. The growth of the yeast plant destroys a small amount of nutritive material, but this loss is of course not of so much importance from a practical standpoint.

Bread which has been kneaded only once has a sweeter flavor than that moulded twice, but the texture is coarse and the appearance less attractive. The best temperature for baking bread is from 450° to 550° F., so that the interior of the loaf will reach the boiling-point of water (212° F.). The lightness of raised bread is due to the presence of gas bubbles and to their expansion by heat. Cereals like corn and rice cannot be used for breadmaking without a mixture of wheat flour or other material, since they do not contain gluten and so cannot form these air bubbles with tenacious walls. Aërated bread, which is popular in London, was invented by an English physician, Dauglish, in 1856, and is made without the use of yeast by incorporating carbon dioxide with the dough by means of a special machine. When baking powder is used in the manufacture of bread, cake, etc., the carbon dioxide needed to lighten the dough is liberated when the baking powder, which should be thoroughly distributed throughout the mass, comes in contact with the water or milk used to wet the dough.

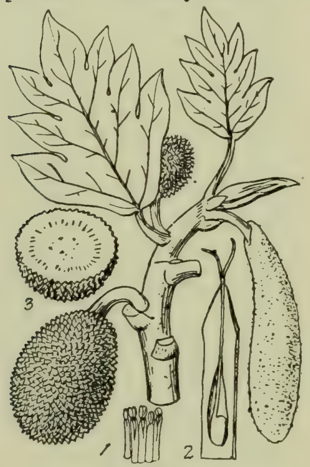
In modern bakeries bread is made entirely by machinery and need not be handled at all by the hands until it is delivered to the customer. White bread made from standard patent flour contains on an average 35.3 per cent. water, 9.2 protein, 1.3 per cent. fat, 53.1 per cent. carbohydrates, and 1.1 per cent. ash, its fuel value being 1,200 calories per pound, and very closely resembles in composition the standard patent flour from which it was made when the two are reduced to the same water content. Whole wheat flour or entire wheat flour and Graham flour are also used for breadmaking. Graham flour retains all of the bran of the wheat, and the entire wheat flour a considerable portion of it. Breads made from these flours contain somewhat more protein and mineral matter than standard patent flour bread, but are not as thoroughly digested, so that as regards the amount of nutritive material which the body actually receives, the three sorts of bread are about equal. The coefficients of digestion of standard patent flour are: Protein 88.6 per cent., and carbohydrates 97.7 per cent. In general it may be said that while the coarser grades are not more nutritious than the finer flours, there are many cases in which they are especially desirable, as, for instance, for persons of sedentary habit and occupation, because their stimulating of the alimentary tract may help to produce a larger secretion of the digestive juices and also to overcome a tendency to constipation.

The estimated consumption of wheat in the United States is 6.23 bushels per head per year. This would be equivalent to about 277 pounds of flour. It seems certain that at least three-fourths of this is used for bread. To sum up, wheat flour of all grades, and breads made from it, are among the cheapest, most digestible, and most nutritious of human foods, and well worthy of the high estimation in which they are generally held. Though furnishing a fair proportion of protein, breads are essentially carbohydrate foods, and so may very properly be combined with meat, milk, eggs, and other nitrogenous materials to form a well balanced ration.

Breadalbane, dist., W. Perthshire, Scotland, comprising many lofty peaks of the S. Grampians, the highest being Ben Lawers (3,984 ft.). It is drained by the feeders of Loch Rannoch, Loch Tay, and Loch Lyon, and is rendered accessible by good roads through Glen Dochart, Glen Lyon, and Glen Rannoch.

Bread-fruit. The bread-fruit

tree (*Artocarpus incisa*) is a native of the E. Indies and the islands of the Pacific, where its fruit constitutes an important article of food. The tree grows to a height of about 40 ft., and has bold, leathery leaves varying from a foot to half a yard in length. The male flowers are borne in catkins, the female appear as globular heads. The fruit is of the size and shape of a melon with knobbed rind. The young fruit contains a thick, white fluid which is pleasant and nourishing, but it is generally allowed to develop to a more solid condition before being used as food. It is usually cooked in a hole in the ground; it is cut into several pieces, and the core is removed; after which it is placed on heated stones for half an hour, with leaves, in alternate layers. It contains about three per cent. of albumin and fourteen per cent. of carbohydrates.



Bread-fruit.

1, Stamens; 2, pistil; 3, section of fruit.

Bread Nut, the fruit of *Brosimum alicastrum*, of the Urticaceæ, common in the W. Indies, etc. The nuts taste like hazel nuts, and, roasted or boiled, are used as bread; the leaves and shoots are greedily eaten by cattle. The wood resembles mahogany.

Bread-root. See YAM and PSORALEA.

Bread-tree. See KAFFIR BREAD.

Breakbone Fever. See DENGUE.

Breakers. See WAVES.

Break Joint, the overlapping of similar pieces of timber, stone, or iron so that two joints should not occur at the same point, which would produce a weak structure. In masonry and bricklaying this is called 'breaking bond.'

Breakspear, NICOLAS. See ADRIAN IV., POPE.

Breakwaters. See HARBORS.

Bream (*Abramis*), fish belonging to the carp family, distinguished by the compressed and elevated body, the short dorsal fin, and the absence of barbels on the mouth. Of the seven European species, two are British, the common bream (*A. brama*) and the white bream (*A. blicca*). Bream are often exceedingly abundant in slowly-moving waters, and on some parts of the Continent are the object of an important fishery. In the United States the name is indefinitely applied to various small cyprinoid fishes.

Breast, popularly used for the thorax or chest, but here restricted to its anatomical sense—*i.e.* the milk gland or mamma of mammalia. Breasts exist in the male as well as in the female—in the former only in a rudimentary state, unless their growth has been excited by peculiar circumstances. In the female they are two hemispherical eminences in the pectoral region, corresponding to the intervals between the third and sixth or seventh ribs, and extending from the sternum to the axillæ. They are of small size before puberty, enlarge during pregnancy, and become atrophied in old age. The outer surface is convex, and has a small conical prominence, the nipple. The mamma consists of glandular lobes, of fibrous tissue connecting the lobes, and of fatty tissue in the intervals between them. The lobes are connected by areolar tissue with blood-vessels and ducts. The ducts unite to form larger ones, which terminate in excretory ducts opening into the nipple. During pregnancy the alveoli or spaces in the glands enlarge, and the cells undergo rapid multiplication. The cells in the centre of the spaces at the commencement of lactation undergo fatty degeneration, and are eliminated as colostrum corpuscles. The peripheral cells of the spaces remain, and form in their interior oil globules, which are ejected into the lumen of the alveolus, and constitute the milk globules.

Diseases of the Breast.—Inflammation, or mastitis, is frequent during lactation, morbid or defective states of the nipple being the most common causes. It often passes on to suppuration or abscess. When actual congestion of the gland tissue exists, it should be reduced by mechanical means or bandaging. When inflammation is present, the local application of warmth, the application of belladonna, and a suitable support for the breast are required. Sometimes the milk accumulates, forming a cyst or galactocele, which varies in size from time to time. The treatment consists in opening, removing the contents, and drainage. At other times a portion of the breast becomes the seat of chronic lobular mastitis, which can be reduced by local soothing applications and attention to the general health. The breasts are the seat of tumors—some non-malignant, as cysts, adenoma, and fatty tumor; others malignant, as sarcoma or cancer. Cancer of the breast occurs in two chief forms—scirrhous or hard, and encephaloid or soft. In both of these lymphatic glands are included, and the only hope of cure is early removal. Diseases of the nipple may be due to (1) defective formation, remedied by the use of an exhausting glass; (2) fissures or cracked nipple, which may lead to abscess. Fissure is formed during sucking, is very painful, and should be guarded against by the use of astringent or spirit lotions during the later months of pregnancy; and while nursing, by perfect cleanliness, and by drying the nipples after suckling. Once fissured, the nipple should be protected by a shield, and dusted often with a drying antiseptic powder, such as oxide of zinc.

Breastplate. (1.) The Jewish high priest's breastplate was made of embroidered linen, wherein were inserted four rows of jewels, twelve in all, engraved with the names of the tribes of Israel. (See Ex. 28:15 *ff.*) (2.) A cuirass, formed first of linen or of leather, afterward of metal, bronze, or brass plates, generally without collars, worn by Egyptian, Greek, Roman, and Hebrew soldiers. See J. G. Wilkinson's *Antiquities*, i. (1878).

Breath. See RESPIRATION.

Breccia, a rock consisting of angular fragments united by a matrix. The shape of the components indicates that they have been produced by fracture, and have not been subjected to rounding by attrition. 'Fault breccia' is often found between the two walls of a geological fault, and is due to the breaking down of the rocky walls when grinding on one another. Mineral veins are often formed in fissures, and are brecciated later by movement of the walls. Volcanic breccias are produced by the consolidation of the coarse ejecta of volcanoes, or by the breaking up of a partly cooled lava stream and the subsequent cementation of the fragments. The intrusion of igneous rocks often lead to the formation of breccias along the contact with the neighboring formations.

Brechin, par. (13,922 ac.), tn., parl. and royal bur., Forfarshire, Scotland, on the South Esk, 8½ m. by road W. of Montrose; manufactures paper, linen, and sailcloth; has bleachfields and distilleries. Its antiquities include the castle, the round tower, and the cathedral (1150). Pop. (1911) of tn. 8,439; of par. 9,836.

Breckenridge, John (1797–1841), American clergyman, was born near Lexington, Ky., and graduated (1818) at Princeton. He became a Presbyterian clergyman, and was chaplain of Congress, 1819–21. After filling several pastorates, he was appointed professor of theology in Princeton Theological Seminary, 1836, and two years later was made secretary and general agent of the Presbyterian Board of Foreign Missions. His controversy with Archbishop Hughes on the respective merits of the Roman Catholic and Presbyterian churches attracted much attention, and the papers were collected and published (1836). Mr. Breckenridge had a considerable reputation as an old-school pulpit orator.

Breckenridge, Robert Jefferson (1800–71), American clergyman and educator, brother of John (1797), was born near Lexington, Ky., and graduated (1819) at Union. He studied and practiced law for several years, but in 1829 joined the Presbyterian Church, freed his slaves, and in 1832 was licensed to preach, becoming pastor of the 2nd Presbyterian Church at Baltimore, where he remained thirteen years. He was made president of Jefferson College, Pa., 1843, but accepted a Presbyterian pastorate in Lexington, Ky., two years later. From 1853 until his death he was professor of theology at Danville, Ky., Theological Seminary. Mr. Breckenridge edited various publications. He was conservative before the Civil War, but a supporter of the Union during that struggle. He had much to do with the establishment of the public school system in Kentucky. Author of several polemical works and volumes of travel.

Breckinridge, John Cabell (1821–75), American lawyer, political leader, and soldier, born near Lexington, Ky. He was educated at Centre College, Danville, Ky., and at the Transylvania Institute Lexington, Ky.; served as a major of volunteers in the Mexican War (1846–7), and became a prominent lawyer and political leader in Ky. He was a Democratic representative in Congress (1851–5) and was vice-president of the U. S. (1857–61). In 1860 at Baltimore he was nominated for the presidency by the seceders from the regular Democratic convention, representing only 21 states, and in the ensuing election stood next to Lincoln, receiving 72 electoral votes—those of Ala., Ark., Del., Fla., Ga., La., Md., Miss., N. C., S. C., and Tex. He was immediately elected to the U. S. Senate, but withdrew and joined the Confederate army with the rank of major-general (commissioned Aug., 1861). He took a conspicuous part in the battles of Murfreesboro, Chickamauga, Chattanooga, and Cold Harbor, and was defeated by Gen. Sheridan in the Shenandoah Valley in 1864. From Jan. to April, 1865, he was Secretary of War in the cabinet of Pres. Davis, and on the collapse of the Confederacy fled to Europe, where he remained until 1868, subsequently living near Lexington, Ky.

Breckinridge, Joseph Cabell (1842), American soldier, born at Baltimore, Md., the son of the Rev. Robert J. Breckenridge. He was educated at Centre College, Danville, Ky., and at the University of Virginia, and in the Civil War served as a lieutenant in the Federal army, winning the brevets of captain (July, 1864) and major (Mar., 1865). He became a brigadier-general and inspector-general in the U. S. army in Jan., 1889; served in the Spanish-American War as a major-general of volunteers (commissioned in May, 1898), taking part in the Santiago campaign and being in command of the camp at Chickamauga; and in April, 1903, was made a major-general in the regular army and retired from active service.

Brecknock, or Brecon, munic. bor. and mrkt. tn., cap. of Brecknockshire, on the Usk, 29 m. S.W. of Hereford; contains Christ College (originally a Dominican friary, and converted by Henry VIII. into a grammar school), and the Congregational Memorial College, founded in 1869. There is a considerable trade in lime, and in the manufacture of flannels and woollens. Mrs. Siddons, the actress, was born here in 1755. In the vicinity are Roman remains. Pop. (1911) 5,908.

Brecknockshire, or Brecon, an inland county of Wales, W. of Herefordshire. Area, 742 sq. m. The surface is very mountainous, and presents much picturesque scenery. The chief mountain ranges are the Black Mts. in the S.E., the Brecknockshire Beacons in the centre (highest point, 2,907 ft.), the Black Mts. in the S.W., and the Epynt Hills in the N. The principal rivers are the Usk, Wye, and Yrfon, and the upper courses of the Towy, Neath, Tawe, and Taff. The county forms part of the great S. Wales coal field. Iron, building-stone, limestone, lead, and copper also occur. The soil is very varied—fertile along the banks of the Wye and the Usk, but the higher mountainous districts are suited only for pasturage. Oats and corn are the chief crops. Coarse woollens and hosiery represent the textile industries, and there are iron works at Beaufort and Clydach, lead-mining at Nant-y-garw (8 m. from Rhayader), and slate at Cwm Yrfon (3 m. from Llanwyrtyd). There are many remains of antiquarian interest, such as Roman stations, stone circles, and cromlechs. See T. Jones's *History* of the county (2 vols. 1805–9; repr. 1898). Pop. (1911) 59,298.

Breda, tn., prov. N. Brabant, Netherlands, 19 m. S.E. of Dordrecht. The Reformed Church contains fine burial monuments to the early counts of Nassau-Dillenburg. The old castle (1536–1696) is now used as a military academy. Carpets, cloth, and hosiery are manufactured. Here were signed the compromise of Breda in 1566, a protest of the Dutch nobility against the Spanish rule; the declaration of Breda in 1660 by Charles II. of England, in which he granted a free pardon and promised religious toleration; and the peace of Breda in 1667 between England and Holland. Pop. of comm. (1899) 26,096.

Bredahl, Christian Hviid (1784–1860), Danish poet, born and died a poor peasant; an opponent both of the romantic poetry of Oehlenschläger and of the realistic novels of Gyllembourg-Ehrensvärd; wrote *Dramatiske Scener* (1819–33; new ed. 1855).

Brederoo, Gerbrand Adriaenss (1585–1618), Dutch comic dramatist, was born at Amsterdam, and professed painting; but his reputation rests upon the farces *Kluchten* (1612), *Symen sonder Soeticheyt* (1613), and *Van den Meulenaer* (1613); the comedies *Moortje* (1615), and *Spaansche Brabander Jerolimo* (1618); and a volume of verse, *Groot Liedboeck* (1622). His collected works were edited by Jan ten Brink and others in 1885–90 (3 vols.). See a monograph in Dutch by Jan ten Brink (2nd ed. 1888).

Brederode, Henry, Count of (1531–68), Dutch patriot, leader, with Egmont and Horn, in the revolt against the Spanish rule of Cardinal Granvella. In 1566 he presented to Granvella's successor, Margaret, Duchess of Parma, the famous 'Request,' the refusal of which led to the insurrection of the Gueux, or 'Beggars.' He died in Germany.

Bredow, a suburb of Stettin, Germany, with factories, iron works, and shipbuilding yards. The Atlantic liners *Deutschland* and *Kaiser Wilhelm der Grosse* were built here. It was absorbed in Stettin in 1900.

Bredow, Gottfried Gabriel (1773–1814), German historian, author of popular historical works, such as *Merkwürdige Begebenheiten aus der Weltgeschichte* (some 40 eds.), *Handbuch der alten Geschichte* (several eds.), *Weltgeschichte in Tabellen* (nearly a dozen eds.), *Chronik des 19ten Jahrhunderts* (1808), etc. See *Life* by Kunisch (1823).

Brée, MATTHIAS IGNATIUS VAN (1773–1839), Flemish painter, was born at Antwerp, and studied art in Paris under Vincent. He won the Prix de Rome in 1797, and in 1827 was appointed director of the Academy at Antwerp. A painter of historical and allegorical subjects, he excelled in coloring. His principal pieces were *Napoleon's Entry into Antwerp*, *Death of Rubens*, and *Van der Werff at the Siege of Leyden.* His brother Philip (1786–1871) was also a painter of some note. The Van Brées painted in the somewhat conventional style of the 18th-century Flemish school.

Breech, Breechloader. See GUN and RIFLE.

Breeches Bible. See BIBLE.

Breeding, a term particularly applied to man's control over the pairing of domesticated and semi-domesticated animals. The domestication of all the more important components of what we may call 'stock' was effected in prehistoric times. Modern attempts to extend the list have not been attended with important success; and, in explanation of the relative failure, it may be suggested—(1) that the number of docile forms which can breed in captivity or under artificial conditions may actually be very small; (2) that domestication may require a longer time and a greater care in graduating the imposed restrictions than modern attempts have afforded; and (3) that in primitive times men may have possessed some secret in regard to the treatment of wild animals which has been lost with the growth of civilization. But although civilized man has not been able to add much to the roll of domesticated animals, he has done a great deal in the way of multiplying *breeds*, and of improving them along lines which he has selected for his advantage or amusement.

General Theory of Breeding.—In general theory, by some form of isolation, man secures the inbreeding of similar variants until the characters he desires to foster have become more or less prepotent in inheritance, and a new breed is established. His interference consists in selecting particular variants, and in restricting their reproductive radius—positively, by bringing similar forms together; negatively, by preventing intercrossing with dissimilar forms: and this may imply the elimination of many members of the young breed itself.

Complications.—The success of breeding experiments requires attention to a large number of factors which are still imperfectly understood. (1.) Much depends on the original choice of the character, or group of characters, which the breeder seeks to develop. There are well-known 'incompatibles' in the characters of organisms; and groupings of characters which may occur together in a casual freak may entirely fail to be realized in a stable breed. (2.) So far as we know, the breeder cannot expect success if the observed peculiarity which he starts with turns out to be an 'acquired character,' a 'modification' due to habits and surroundings, and not an inborn or germinal variation. (3.) It is easy to speak of securing the inbreeding of similars, and of preventing mixture with other breeds or sub-breeds; but in practice the difficulties are in some cases great—*e.g.* with pigeons, dogs, and cats. (4.) A stable breed may be established quickly, as in the case of the ancon sheep; but it may be the work of a lifetime or more, demanding infinite patience and the most sedulous care. (5.) The essential process of inbreeding may be pursued too far, and degeneration may set in, ending perhaps in impotence; or the introduction of 'fresh blood,' intended to save the desired breed, may be followed by results which give a quite new turn to the reproductive events. (6.) In many cases the development of a breed implies artificial conditions of life (surroundings, food, and habits), which complicate the problem by inducing 'modifications' or acquired bodily characters, theoretically, at least, quite distinct from those inborn or germinal peculiarities which form the only secure foundation of a breed. (7.) Moreover, though we cannot here discuss the details, the breeder has to take account of the age of the parents, their bodily vigor, the relative ripeness of the germ-cells, the normal time of pairing, and a dozen other factors of importance in reproduction.

Some Results of Breeding Experiments.—It is not possible at present to formulate 'laws of breeding.' There are, however, some valuable results which will eventually be incorporated in a unified theory. We propose to refer to a few of these.

1. Carefully-kept records—*e.g.* of basset hounds—have formed part of the basis of Galton's law of ancestral inheritance—an average statistical statement of the fact that inheritance is like a mosaic, the two parents contributing one-half, the four grandparents one-fourth, the eight great-grandparents one-eighth, and so on, of the total heritage of the average offspring.

2. There is no doubt that a variation sometimes crops up which is almost certain to be transmitted in its full strength, even although its possessor is paired with a form that does not possess the peculiarity in question. This prepotency of certain individual variations was probably operative in the origin of some of the more extraordinary breeds, such as ancon sheep, pug-dogs, and short-faced tumbler pigeons.

3. It seems certain that, given healthy stock, breeding in-and-in —*i.e.* within a small circle of blood relations—may be carried much further than most practical breeders are at present inclined to allow. The history of some breeds—*e.g.* of polled Angus cattle—shows in the early years a closeness of inbreeding which could hardly be exaggerated.

4. There is ample evidence to show that inbreeding in a healthy stock tends to develop the prepotency of the breed, giving fixity and stability and certainty of transmission to their peculiar characters. Galloway cattle may be cited as a good example of an extremely prepotent breed.

5. The experiments of Ritzema-Bos and others on the inbreeding of rats and mice, and the less precise experience of breeders of valuable stock, show, on the other hand, that inbreeding may be carried too far, and may lead to degeneration, frequent abnormalities, abortions, and sterility. Sometimes, however, the collapse may be traceable to the artificial preservation of notably weak members who should have been detected and eliminated before they became reproductive. This leads to the question of intercrossing or outbreeding (exogamy) between members of different breeds.

6. While inbreeding induces fixity and prepotency, outbreeding or intercrossing of breeds is certainly provocative of variation. As Professor Ewart puts it: 'It is only necessary to interbreed half-bred animals, the offspring of two varieties that have long lived apart. . . . in order to obtain an epidemic of variation, to induce a more or less prolonged period of "sporting."' Ewart's experiments with rabbits seem to prove this up to the hilt.

7. But the results of intercrossing different breeds are so diverse that they may be called unpredictable. Following Ewart, we may summarize the more striking results:—(1.) The offspring, down to minute details, may be all but intermediate between the two parents; but this is not very common. (2.) The offspring may resemble one of the parents. (3.) Some of the offspring may resemble one of the parents, and some the other. (4.) The offspring may combine, almost unimpaired, the more striking characters of both breeds; but this is very rare.

In regard to pigeons, for instance, it seems very difficult to combine the distinctive characters of two well-marked breeds. (5.) Sometimes new, or at least unexpected, characters appear in the offspring—*e.g.* a tailless rabbit, a spinning rabbit like a Japanese dancing mouse, a chestnut crow, and so on. (6.) The offspring of half-breeds are usually extremely variable. (7.) Sometimes the offspring, instead of resembling the parents, resemble former ancestors—a phenomenon which is, in some cases, interpretable as a reversion.

8. In 1865 Gregor J. Mendel published the results of numerous experiments on the hybridization of plants, of varieties of pea in particular, and formulated what is now called Mendel's law—an induction of profound importance in connection with breeding. His masterly work remained all but unknown till 1900, when De Vries, Correns, and Tscheümak reached similar conclusions. These have been confirmed by the experiments conducted by Bateson and Saunders, for animals as well as plants; and no one should now theorize or experiment on breeding without first making himself familiar with Bateson's statement and vindication of Mendel's law. Within our space we cannot do justice to Mendel's discovery, but the gist of it, in Bateson's words, is this: 'The germ-cells or gametes produced by crossbred organisms may, in respect of given characters, be of the pure parental types, and consequently incapable of transmitting the opposite character; that when such pure similar gametes of opposite sexes are united together in fertilization, the individuals so formed and their posterity are free from all taint of the cross; that there may be, in short, perfect or almost perfect discontinuity between these germs in respect of one of each pair of opposite characters.' See MENDELISM.

9. A careful scrutiny of the results of breeding does not seem to furnish any secure evidence in favor of the belief in the transmission of acquired characters or 'modifications;' but it is only fair to say that some expert breeders—*e.g.* Brewer—find the evidence satisfactory. The same remark must be made in regard to telegony—the supposed influence of a previous sire on the subsequent offspring of the same mother by a different father.

See W. Bateson and Miss E. R. Saunders, *Reports to the Evolution Committee, Royal Soc., Lond.*, 1901—a very valuable record of experiments; W. H. Brewer, series of papers in the American journal *Agricultural Science*, 1892 and 1893; E. D. Cope, *The Primary Factors of Organic Evolution* (1896)—deals at some length with breeding, and expounds Brewer's conclusions; Ch. Cornevin, *Traité de Zootechnie Générale* (1891)—an important treatise; Charles Darwin, *Variation of Plants and Animals under Domestication* (1868)—the classic work on the variations of breeds; J. Cossar Ewart, *The Penicuik Experiments* (1899); 'Variation: Germinal and Environmental,' in the *Scientific Transactions, Royal Dublin Soc.*, vii.353–378(1901)—a valuable continuation of the book above cited; P. Geddes and J. Arthur Thomson, *The Evolution of Sex* (4th ed. 1901); V. Hensen, *Physiologie der Zeugung* (1881)—a valuable treatise, necessarily a little out of date; G. J. Mendel, *Versuche über Pflanzenhybriden* (Abh. Nat. Ver., Brünn), reprint in Ostwald's *Klassiker* (1901), also in *Flora* (1901), and trans. in *Jour. Roy. Horticultural Soc.* (1901)—a very valuable record of experiments not as yet duly appreciated; H. von Nathusius, *Vorträge über Viehzucht und Rassenkenntniss* (1872); G. J. Romanes, *Darwin and after Darwin* (3 vols. 1893, 1895, 1897)—giving many illustrations of the evolutionary interest of breeding; A. Sanson, *Traité de Zootechnie* (2nd ed., five small vols., 1874–8; vol. ii. on laws and methods of breeding), and *L'Hérédité Normale et Pathologique* (1893)—paying much attention to breeding; H. Settegast, *Die Thierzucht* (2 vols. 5th ed. 1888)—a valuable treatise by an expert in touch with biological progress; H. de Vries, *Die Mutationstheorie*, vol. i. (1901); Alfred Russel Wallace, *Darwinism* (1889); August Weismann, *The Germ-Plasm* (1893), and *The Evolution Theory* (Eng. trans. 1904).

BREEDERS' ASSOCIATIONS IN AMERICA. There are numerous associations of breeders of domestic animals in America, of which the following are most important:

Cattle. American Aberdeen-Angus Breeders' Association, Ayrshire Breeders' Association, Brown Swiss Cattle Breeders' Association, American Devon Cattle Club, Dutch Belted Cattle Association, American Galloway Breeders' Association, American Guernsey Cattle Club, American Hereford Cattle Breeders' Association, Holstein-Friesian Association of America, American Jersey Cattle Club, American Polled Durham Breeders' Association, Polled Hereford Club, Red Polled Cattle Breeders' Association, American Shorthorn Breeders' Association, National Improved Saxony Sheep Breeders' Association, American Shropshire Registry Association, American Southdown Breeders' Association, American Suffolk Flock Registry Association.

Swine. American Berkshire Association, Cheshire Swine Breeders' Association, American Chester White Record Association, American Duroc-Jersey Swine Breeders' Association, American Essex Association, American Hampshire Swine Record Association, American Poland-China Record Company, American Suffolk Association, American Tamworth Swine Record Association, American Yorkshire Club, Improved Small Yorkshire Club of America.

Horses.—American Association of Importers and Breeders of Belgian Draft Horses, American Clydesdale Association, French Coach Horse Society of America, German Hanoverian and Oldenburg Coach Horse Association of America, American Hackney Horse Society, American Morgan Register Association, Oldenburg Coach Horse Association of America, American Percheron Horse Breeders' and Importers' Association, American Saddle Horse Breeders' Association, American Shetland Pony Club, American Shire Horse Breeders' Association, American Suffolk Punch Horse Association, American Trotting Registry Association, American Breeders' Association of Jacks and Jennets.

Sheep.—American Cheviot Sheep Society, American Cotswold Registry Association, Dorset Horn Sheep Breeders' Association of America, Hampshire Down Breeders' Association of America, American Leicester Breeders' Association, American Lincoln Sheep Breeders' Association, National Delaine Merino Sheep Breeders' Association, American Rambouillet Sheep Breeders' Association, Improved Black Top Merino Association, United States Merino Sheep Breeders' Registry Association, American Oxford Down Record Association.

Breed's Hill, in Charlestown, Mass. (now Boston), the field of battle to which the name of a neighboring eminence, Bunker Hill, was attached through popular error.

Breeze. See WIND.

Bregenz (anc. *Brigantium*), tn. and summer resort of Austria, the cap. of Vorarlberg, stands at the E. end of the Lake of Constance, 121 m. N.W. of Innsbruck. It consists of the upper old town and the lower new town down beside the lake. Its chief feature is the National Museum of Antiquities, with many Roman remains. The people are engaged in silk mills, and make fancy ornaments. Pop. (1900) 7,595.

Brehm, ALFRED EDMUND (1829–84), German naturalist.

He was born in Reuthendorf, studied at Jena and at Vienna, and travelled extensively in Europe, Asia, and Africa. He was director of the zoological gardens in Hamburg (1863–7), and founder and director of the aquarium in Berlin (1867–75). His most famous work is his *Illustriertes Tierleben*, or 'Animal Life' (10 vols.; Eng. trans. 1895), whose accurate delineations won immediate recognition.

Bre′hon Laws, the name used to denote the jurisprudence of ancient Ireland. The Gaelic MSS. embodying these laws, of which the *Senchus Mòr* (Great Book of the Ancient Law) and the *Book of Aicill* are the most noteworthy, have been translated into English and published in a series of five volumes, with a sixth volume as *Glossary*, under the title of *The Ancient Laws of Ireland* (1865–1901). It is the work of half a century, authorized by a royal commission constituted on Nov. 11, 1852, and carried out by various distinguished scholars.

Breisgau, brīs′gou, in the Middle Ages a *gau*, or district of Alemannia, the country of the Germanic tribe of the Alemanni. It included the valley of Freiburg and the south of the Black Forest, and embraced an area of 600 to 700 square miles.

Breitenfeld brī′ten-felt, village, Germany, in the district of Leipzig, Saxony, 4 miles north of Leipzig. It is noted as the place where, in 1631, Gustavus Adolphus of Sweden defeated the forces of the Catholic League of the empire, commanded by Tilly. See also LEIPZIG.

Breitkopf, brīt′kopf, BERNHARD CHRISTOPH (1695–1777), founder of the Leipzig printing house of Breitkopf, now Breitkopf and Härtel. He established himself at Leipzig in 1718, and after 1726 attracted notice by his admirable printing of Gottsched's works.

Breitkopf, JOHANN GOTTLIEB EMMANUEL (1719–94), son of Bernhard Christoph Breitkopf, was born in Leipzig. He followed his father's profession and in 1750 invented movable music type, improved the shape of the German characters, devised a method of printing maps and pictures from movable pieces, and wrote several valuable works on typography.

Breitmann, HANS. See LELAND, CHARLES GODFREY.

Bremen, brā′men, free state, Germany, between the grandduchy of Oldenburg and the Prussian province of Hanover; area 99 square miles. It is governed by a constitution adopted in 1920. The duchy of Bremen was assigned in 1648 to Sweden, whence it was sold in 1715 to Hanover. Pop. (1919) 311,266.

Bremen, seaport, Germany, capital of the state of Bremen, on the Weser river, 46 miles from the North Sea and 72 miles southwest of Hamburg. It lies in a sandy plain on both banks of the river and consists of two parts, the old town on the right bank, enclosed by ramparts, and the new town on the left bank, with broad paved streets and handsome buildings. Features of interest are the Rathaus, a handsome Gothic building erected in the fifteenth century, the Exchange, the Cathedral, built in the twelfth century as a basilica, Gewerbehaus, the old guild hall of the cloth merchants, the Municipal Museum of natural history, ethnology and commerce, and the Kunsthalle, containing some good modern paintings and sculptures.

Several bridges connect the old and new towns and fine promenades have been laid out on the old ramparts surrounding the old town. Many statues adorn the city, chief among which are those of Bismarck, William I., Frederick III., Moltke; and Bürger Park is an attractive spot laid out in English style.

Bremen is the second largest port in Germany and is commercially important. It imports large quantities of cotton, wool, grain, tobacco, rice and coffee and exports wool, hides, glass and wooden toys. The North German Lloyd steamship company, whose chief port it is, before the Great War had a fleet of 982,952 tons register, most of which it lost by the Treaty of Versailles, but in 1922 regular sailings were resumed between Bremen and New York and by 1925 shipping had reached almost its pre-War level. The chief industries are shipbuilding, manufactures of cigars, paper, cotton and woollen goods, sugar refineries, distilleries, and breweries. Pop. (1919) 269,806. The town owes its origin to a bishopric founded in 788 by Charlemagne. It joined the Hanseatic League in the thirteenth century, and was very prosperous throughout the sixteenth century. Its modern commercial prosperity dates from the founding of Bremerhaven in 1830.

Bremer, brā′mer, FREDERIKA (1801–65), Swedish novelist, was born in Tuorla, near Åbo, Finland. Her first book, *Teckningar ur Hvardagslifvet* which appeared in 1828, was followed by a series of romances with a common title, of which *Familien H . . .* (1833), *Grannarne* (1837), *Presidentens Döttrar* (1834), *Hermmet* (1839), *I Dalarne* (1845) all translated into English by Mary Howitt, are generally regarded as the best. She spent two years (1849–50) in America, impressions of which are recorded in *Hemmen inya verlden* (1853), and in 1856–61 she travelled in Europe. She received the Swedish Academy gold medal in 1844. Miss Bremer's works faithfully portray Swedish middle-class life but in her later novels she adopts the rôle of the philanthropist and reformer.

Bremerhaven, brā′mer-hä′fen; *Eng.* brem′er-hä′ven, or BREMERHAFEN, seaport (outport of Bremen), Germany, in the state of Bremen, at the mouth of the Weser, on its right bank, 45 miles northwest of Bremen. The town dates from 1827, when Bremen bought land from Prussia, whereon she has since constructed three large harbor basins, besides docks (including the dry dock of the North German Lloyd) and wharves. Pop. (1919) 24,200.

Bremerton, city, Washington, in Kitsap County, on Puget Sound and on the Washington Steamship Line; 17 miles west of Seattle. It is a modern well built city and is the seat of the Puget Sound navy yard, which has three large dry docks, one of which is a construction dock in which two large ships can be built at the same time. Industries include saw mills, cigar factories, and machine shops. In 1927 it was consolidated with Charleston. Pop. (1910) 2,993; (1920) 8,918.

Brendan, bren′dan, or BRENAINN, ST. (484–577), of Clonfert, called 'son of Finnloga' to distinguish him from St. Brendan of Birr, is the hero of the *Navigation of St. Brendan*, a popular tale of the Middle Ages. He is said to have visited certain islands in the Atlantic, which suggest the familiar Greek legend of the Isles of the Blest. Brendan visited St. Columba (563) at Iona. His day is May 16.

Brendan, ST. (?490–573), of Birr, now Parsonstown, in King's county, Ireland. A disciple of St. Finnian of Clonard, he was the friend of Columba, was present at his excommunication and advised him to settle at Hy. His day is November 29.

Bren′eman, ABRAM ADAM (1847–), American chemist, was born in Lancaster, Pa. He was graduated (1866) from Pennsylvania State College, where he was instructor and professor in chemistry until his appointment (1875) to a similar position at Cornell, where in 1879 he became professor in industrial chemistry. After 1882 Professor Breneman resided in New York City, occupied as a chemical expert, analyst, writer, and lecturer, giving special attention to the subject of water and its contaminations and to the chemistry of ceramics and explosives. He is joint author with Dr. Caldwell of a chemical text-book and has published many scientific papers and is the inventor of a process for making iron non-corrodible. In 1884–93 he edited the *Journal of the American Chemical Society*, of which he was a vice-president in 1890.

Brenham, city, Texas, county seat of Washington County, on the Southern Pacific and the Gulf, Colorado and Santa Fé Railroads; 75 miles northwest of Houston. The city has a public library and is the seat of the Blinn Memorial Junior College and is an important centre for the trade and manufacture of cotton and by-products. Brooms, mops, ploughs, and iron goods are also manufactured, and the city is one of the chief markets of the grain industry of the district. Pop. (1910) 4,718, (1920) 5,066.

Bren'ner, village and summer resort, Austria, in the Tyrol, near the head of the Brenner Pass, 25 miles south of Innsbruck. Thermal springs are a feature of the village.

Brenner Pass, a mountain pass which connects the valley of the Inn with that of the Etsch (Adige). It is the lowest (4,485 feet) of the great Alpine passes, and was used by the Romans between Verona and Augsburg. It was made practicable for wheeled vehicles in 1772, and in 1867 a railway, 78 miles long, was opened, which connects the railway systems of Germany and Austria with Italy.

Brenner, VICTOR DAVID (1871–1924), American sculptor and medalist, was born in Shavly, Russia. He went to the United States when a young man and after being employed as a die cutter, went to Paris where he studied under Roty. Among the medals he designed are the seal of the New York Public Library, the Lincoln cent, and portrait medals of Whistler, Roosevelt, Carl Schurz and many others. He is the author of *The Art of the Medal* (1910).

Brennus, the leader of the Gallic tribe of the Senones, who, in 390 B.C., after besieging Clusium, marched on Rome, defeated the Romans at the battle of the Allia, and took and burnt their city. After a long siege it is probable that by means of ransom the Senones were bribed to retire.

Brennus, the leader of the Gauls who invaded Greece in 279 B.C. After being checked at Thermopylæ, they devastated Ætolia, and advanced on Delphi, where they were completely defeated, and Brennus committed suicide.

Died Mar. 27, 1929

Brent, CHARLES HENRY (1862–), American Protestant Episcopal bishop, was born in Newcastle, Ont. He was educated at Trinity College, Toronto, ordained priest in 1887, and held charges in Buffalo (1887) and Boston (1888–1901). In 1901 he was elected bishop of the Philippine Islands and in 1918 became bishop of Western New York. In 1908 he declined the bishopric of Washington, D.C., and in 1914 that of New Jersey. He has served several times as delegate to the International Opium Conferences and in 1927 played an important part in the Lausanne Conference on Faith and Order. In the Great War he was chief of the Chaplain service of the A. E. F. in France, and is an officer in the Legion of Honor. His publications include *With God in the World* (1889), *The Consolations of the Cross* (1902), *With God in Prayer* (1907), *The Mind of Christ* (1908), *The Sixth Sense* (1911), *Presence* (1914), *Prisoners of Hope* (1915), *The Mount of Vision* (1918).

Brentano, bren-tä'nō, CLEMENS (1778–1842), German poet and novelist, a leader of the younger Romanticists, was born in Ehrenbreitstein. He studied at Jena and in 1801 recorded his early experiences of life and love in *Godwi*, a frivolous book patterned after Schlegel. He later went to Heidelberg, where, together with his friend Achim von Armin, he published (1805–8) *Des Knaben Wunderhorn*, or *Boy's Magic Horn*, a collection of popular folk songs which they dedicated to Goethe, and which is Brentano's most important work. After a somewhat wandering and unsettled life he entered the Roman Catholic Church becoming a devout adherent of its doctrines. Among his other works are *Die Geschichte vom braven Kaspar*, *Romanzen vom Rosenkranz*, *Gockel, Hinkel und Gockeleia*.

Brentano, LUIS JOSEF, 'LUJO' (1844–), German political economist, was born in Aschaffenburg, Bavaria. He was educated at Heidelberg, Göttingen and other universities and was professor of political economy at Breslau (1872). Strassburg (1882), Vienna (1888), Leipzig (1889), and Munich (1891). He has made a special study of the working classes both from the historical point of view and from the actual present-day conditions. His published works include *Die Arbeitergilden der Genewart* (1871–2), *Die Arbeitsversicherung* (1879), *Der Arbeiterversicherungszwang* (1881), *Die Christlichsoziale Bewegung in England* –2nd ed. 1883), *Agrarpolitik* (1897), *Die Wirtschaftliche Lehren des Christlichen Altertums* (1902), *Die deutsche Getreidzölle* (1911), *Clemens Brentano's Liebesleben* (1921), *Die Urheber des Weltkreigs* (1922), *Konkrete Grundbegunger der Volkswirtschaft* (1924).

Brentford, market town, England, county town of Middlesex, on the river Brent; 8½ miles west of St. Paul's, London. There are soap works, distilleries, breweries, and market gardens. It was the scene, in 1016, of Edmund Ironside's defeat of the Danes. Pop. (1921) 17,039.

Brent Goose. See BRANT.

Brenz, brents, JOHANN (1499–1570), German theologian and Protestant reformer, was born in Weil. He was educated at Heidelberg and being won over to Lutheranism escaped a trial for heresy by accepting a call to the church at Hall, which he reorganized. He took part in the Marburg Disputation (1529), the Augsburg Conference (1530), and the Conferences of Hagenau (1540), Worms (1540), and Ratisbon (1541 and 1546); and was one of the authors of the Wurtemberg Confession. In 1553 he became provost of the cathedral of Stuttgart, whither he betook himself on the issue of Charles V.'s 'Interim,' which he strenuously opposed.

Brescia, bresh'ä, province, Italy, between the Tyrol, Lake Garda, and the river Oglio; area 1,823 square miles. The principal products are rice, maize, wine, and fruits. Silk, machinery, and leather are the chief manufactures. Pop. (1921) 652,225.

Brescia, city, Italy, in Lombardy, capital of the province of Brescia; 51 miles east of Milan. It is a well built manufacturing city with many Renaissance buildings and monuments. Among the features of interest are the church of Santa Maria dei Miracoli, the cathedral, begun in 1604, the Loggia, architecturally the glory of Brescia, the National Museum of Roman Antiquities, the Mediaeval Museum, and the Pinacoteca Tosio Martinenzo, which contains many examples of the Brescian school of painting. The leading industries are the manufacture of iron and steel, especially small arms for the Italian army, silk, cotton, and woollen mills, paper factories, linen weaving, and wine making. Pop. (1921) 100,168.

Brescia became a Roman town under Caesar but was destroyed by Attila in 452. It was one of the leading Lombard cities to oppose Frederick Barbarossa and in the 15th century became subject to Venice. In 1860 it became a part of the Kingdom of Italy.

Breslau, bres'lou, town, capital of the province of

Silesia, Prussia, commercially and educationally the chief city in Eastern Germany, is situated on the Oder; 190 miles southeast of Berlin. It consists of the old and new towns and five suburbs. Educational institutions are numerous, the most notable being the university founded by the Emperor Leopold I. in 1702. Churches include the cathedral (12th century) and the churches of St. Elizabeth (13th century), St. Magdalene (14th century), and St. John. Among other buildings are the town hall, near which are fine statues of Frederick the Great, Frederick William III. of Prussia, and Blücher; the archepiscopal palace; and the palace of the king of Prussia, now used as a government building. The chief industries are the manufacture of machinery, printing, brewing, distilling, bell casting, flour milling, and gardening. The important articles of trade are metals, textiles, lumber, and wool.

Breslau is of Slavonic origin, and was for many centuries occupied alternately by the Poles and Bohemians. It was subject to Austria from 1526 to 1741; at the latter date it was conquered by Frederick the Great of Prussia. Pop. (1910) 470,000.

Bres′say, one of the Shetland Islands (q. v.).

Brest, fortified seaport, department of Finistère, France, and the principal French naval station, is located on the northwestern coast, on the northern side of the Bay of Brest; 289 miles by rail west of Paris. The harbor, one of the finest in Europe, communicates with the sea only by a narrow channel, scarcely a mile in width, called *Le Goulet.* Forts and batteries guard both the approaches to the harbor and the roadstead, and the difficulty and danger of access to hostile ships are increased by the narrowness of the entrance.

Industry is largely confined to the equipment of the navy. There are extensive shipyards, storehouses, and arsenals, and manufactures of candles, paper, cork, hats, ropes, soap, and leather. Exports are chiefly beer, grain, brandy, and dried fish. Coal, timber, and fertilizers are imported in large quantities.

The splendid position of Brest made it an object of contention to the French, English, and Spanish. It was ceded by a count of Léon to the Duke of Brittany in 1240, and in 1342 passed into the hands of the English. In 1499 it fell to the French by the marriage of Louis XII. with Anne of Brittany, and in 1512 an English fleet under Lord Howard made an unsuccessful attempt to reconquer it. In 1631 Richelieu commenced the fortification of the harbor, and his work was completed under the direction of Vauban (q. v.) in 1680–88. In 1794 a French fleet under Admiral Villaret de Joyeuse was defeated off Brest by an English fleet under Admiral Howe. The town was an important debarkation station for American troops during the Great World War (1914–18). Pop. (1913) 90,540.

Brest-Litovsk, lyē-tôfsk′, town and important fortress, Grodno government, Russian Poland, is situated on the Bug River, and at the junction of the Moscow-Warsaw and Königsberg-Odessa Railroads; 131 miles by rail south of Grodno. It is the see of a Greek Orthodox and an Armenian bishop. It has trade in cloth, grain, leather, and wool.

Brest-Litovsk came into the possession of Russia on the third partition of Poland, in 1795. Vast sums of money were spent upon its fortification, and it was considered an impregnable stronghold up to its capture by the Germans during the Great War (1914–18). It was taken by General von Mackensen on Aug. 25, 1915, having been practically reduced to ruins by the Russian troops before they evacuated it. Pop. 55,000, over half Jewish.

Treaty of Brest-Litovsk.—Peace negotiations between Germany, Austria, Bulgaria, and Turkey on one side and Russia on the other were opened at Brest-Litovsk on Dec. 22, 1917, and on March 3, 1918, the peace treaty between the Central Powers and Russia was signed by the plenipotentiaries of the respective nations. By the terms of the treaty Russia surrendered to the Central Powers, for their disposal, Finland and the Aland Islands, Ukraine, Russian Poland, the Baltic Provinces (Esthonia, Livonia, Courland), Lithuania, and Russian Armenia, a total of 455,000 square miles, with a population of 56,000,000.

Ukrainian delegates signed a separate peace with the Central Powers at Brest-Litovsk on Feb. 9, 1918. The Supreme War Council of the Allies refused to recognize the treaties, and their renunciation was a condition of the armistice which ended the war (see ARMISTICE). See EUROPE, GREAT WAR OF.

Bretagne. See BRITTANY.

Brethren, Apostolic, a North Italian sect of the thirteenth and fourteenth centuries, which urged a return to the primitive communism of the apostolic church. Its founder, Gerhard Segarelli, a Parma weaver, was, after twenty years of successful preaching in the garb of an apostle, burned at the stake (1300), and the brethren suffered persecution. His successor, Dolcino of Novara, a learned man, educated to the priesthood, and an eloquent preacher of apocalyptic prophecies, maintained himself in arms against Pope Boniface VIII. for two years, but was captured, and was burned at the stake at Vercelli in 1307.

The name was also applied to a sect of the third and fourth centuries, in Asia Minor, which condemned marriage and followed Christian communism, and to a German communist body of the twelfth century.

Brethren, Bohemian. See MORAVIANS.

Brethren in Christ. See RIVER BRETHREN.

Brethren of the Common Life, semi-monastic associations founded by Gerhard Groot (q.v.) at Deventer, in Holland, about the year 1376, for teaching children, copying books, and generally laboring and living in Christian communion. They were likewise known as Brethren of Good Will, Hieronymites, Gregorians, and Collation Brethren.

Brethren, Plymouth. See PLYMOUTH BRETHREN.

Bretigny, bret-ēn-yē′, village, department of Eure-et-Loir, France, near Chartres. By the treaty of Bretigny, May 8, 1360, Edward III. of England gave up his claim to the throne of France. See EDWARD III.

Breton, CAPE. See CAPE BRETON ISLAND.

Breton, bre-tôṅ′, JULES ADOLPHE AIMÉ LOUIS (1827–1906), French painter, a master of the realist school of peasant-painters, was born in Courrières, and studied at Ghent under Devigne, at Antwerp under Wappers, and at Paris under Drolling. He was in touch with the Barbizon school, and one of the first to follow Millet and Courbet in the revolution against academic tradition; but his subjects were less uncompromising and more convincing than theirs, and this tendency towards idealization became still more developed in his later works. His best pieces include *Blessing the Fields* (1857), *Return of the Gleaners* (1859), *Evening and Weeders* (1861), *Potato Harvest* (1868), *The Fountain* (1872), *Song of the Lark* (1885). He was also an author of note. Consult his autobiographical *Vie d'un Artiste.*

Bret′on, NICHOLAS (?1545–1626), English poet and pamphleteer, was son of a London merchant, and stepson of the poet George Gascoigne. Some charming pastoral lyrics in the Spenserian vein are to be found in his *Passionate Shepheard* (1604), and in the miscellany *England's Helicon* (1600). His *Collected Works* were edited by A. B. Grosart (1876).

Bretón de los Herreros, brā-tōn′ dā lōs er-rā′rōs, MANUEL (1796–1873), Spanish scholar and dramatist, was born at Quel. He held various government positions, and in 1837 was elected secretary to the Royal Spanish Academy. He was an indefatigable writer of poems, articles, sketches, and tales, but is chiefly known as a dramatist, much of his work still holding the stage. Among his most notable pieces are *A Madrid me vuelvo* (1828), *Marcela* (1831), *Muérete; y veras* (1837), and *Escuela del matrimonio* (1852). The best collected edition of his works is that of Orozco.

Breton Language and Literature. Breton (Fr. *Bas Breton*), or Armorican, the ancient language of Brittany, is a Celtic dialect, forming, together with Welsh and the extinct Cornish dialect, the Cymbric or southern group of the Celtic languages. It was carried to France by the British Celts who fled from England upon the invasion of the Anglo-Saxons in the fifth and sixth century, and is still spoken by more than 1,250,000 persons, mainly in the department of Finistère, western parts of Cotes du Nord, and in Morbihan. Breton has four distinct dialects, the Vannes, Tréguier, Cornouailles, and Léon, the last being the most important and the purest.

An excellent grammar and dictionary of the language was published by Le Gonidec (3rd ed. 1847–50), while Froude issued an authoritative lexicon (new ed. 1876).

The chief monuments of ancient Breton literature (after the 6th century) are two miracle plays of the fourteenth century—*Le Grand Mystère de Jésus* (ed. by La Villemarqué, 1866) and *Le Mystère de Saint Nonne* (ed. by Le Gonidec, 1833) founded on the life of St. Nonna. The nineteenth century has witnessed an important Breton revival, and a large number of popular traditions, stories, poems, and miraculous narratives have been collected and given to the world. Among the most important collections are Emile Souvestre's legends of Brittany, *Foyer Breton* (1844); M. Luzel's *Légendes Chrétiennes de la Basse-Bretagne* (2 vols., 1881), and *Contes Populaires de la Basse-Bretagne* (3 vols., 1887); M. Paul Sebillot's *Contes Populaires de la Haute-Bretagne* (1880), and *Traditions et Superstitions de la Haute-Bretagne* (1882). Consult E. Renan's *La Poesie des Races Celtique;* Quellien's *Chansons et Danses des Bretons;* D'Arbois de Jubainville's *Les Celtes et les Langues Celtiques; La Revue Celtique.*

Bretschneider, KARL GOTTLIEB (1776–1848), German theologian, was born at Gersdorf, Saxony. He studied theology at Leipzig, became a councillor of the Upper Consistory at Gotha, and gained a reputation as a sound and judicious thinker of rationalistic tendencies. His numerous works include *Systematische Entwickelung aller in der Dogmatik vorkommenden Begriffe* (1805; 4th ed., 1841); *Probabilia de Evangelii et Epistolarum Joannis Apostoli Indole et Origine* (1820); *Lexicon Manuale Græco-Latinum in Libros Novi Testamenti* (1824; 3d ed., 1840).

Brett, WILLIAM BALIOL. See ESHER, WILLIAM BALIOL BRETT, VISCOUNT.

Bretton, HENRY DE. See BRACTON, HENRICUS DE.

Bretts and Scots, LAWS OF THE, an old code of laws, of which only a fragment remains, evidently a survival of Cymric and Gaelic jurisprudence in Scotland. The 'Bretts' were the remnants of the old Britons, who were formerly the chief inhabitants of the island of Great Britain, and continued to occupy certain regions in the south of Scotland, while the 'Scots' were a people who had migrated from Ireland and had settled in the western parts of the same country. Edward I. of England, in his ordinance made for the government of Scotland (1305), specially cancels these laws, as unsuited to the existing civilization of Scotland. The most noteworthy feature of these laws is the institution of the *cro*, which was the price at which every man's life was valued according to his rank and degree, and which had to be paid to his kindred as compensation in the event of his being murdered.

Breughel, brû*ch*′el, BRUEGHEL, or BREUGEL, a family of Flemish painters. (**1.**) PIETER (c. 1530–69) was born at Breughel, near Breda, Netherlands, from which he took his name. He painted chiefly the pleasures of peasant life and landscapes. (**2.**) PIETER THE YOUNGER (1564–1637), his son, was born in Brussels and earned for himself the title 'Infernal,' because of his paintings of hags, witches, devils, and kindred subjects. (**3.**) JAN (1568–1625), a younger brother of the second Pieter, the best of the three, was called the 'Velvet,' presumably from the smoothness of his style. He was born in Brussels and painted miniatures, flowers, and landscapes—*e.g. Paradise, The Four Seasons*—and collaborated in the great painting *Adam and Eve in Paradise* (in the Louvre), the figures in which were painted by Rubens. Consult Michel's *Les Brueghels.*

Breve, brēv, in musical notation a note having the value of two whole notes or semi-breves. See MUSIC.

Breve, an old Scots law term signifying a short, compendious writ issued from the crown to a judge, ordering him to try by jury the points outlined in the writ.

Breven, brā-väṅ′, or BREVENT, a mountain of the Pennine Alps, in Savoy (8,284 ft.) on the north side of Mont Blanc, of which it affords a fine view.

Brevet′, a military commission in the U. S. Army bestowed by the Senate, upon the nomination of the President, as a reward for gallant and meritorious service in the field. Brevet rank entitles the holder to wear the uniform and bear the title of the grade to which he is brevetted, but not to draw the pay or to take the command or precedence usually belonging to the grade.

Breviarium of Eutropius. See EUTROPIUS.

Bre′viary, a book containing the divine office, which every Roman cleric in holy orders and choir, monks, and nuns are bound to recite daily. The Roman office in its complete state dates from the latter part of the seventh century or the beginning of the eighth, and continued unchanged for at least four hundred years. In the thirteenth century it received various additions, chiefly taken from the Franks; and this, which was called by Gregory IX. the 'modern office,' was given by him to the Franciscans in the form of a breviary, properly so called, in 1241. This breviary was introduced into the Roman basilicas under Nicholas III. in 1280, and into the churches of Avignon in 1337 by Benedict XII. The Council of Trent called for a revision of the breviary, and the result was the breviary (1568) of Pius V., with subsequent amendments by Clement VIII. (1602) and Urban VIII. (1631), the breviary of the latter with additions by later popes being that now in use. A decree of Pope Pius X., shortening the offices was issued in 1911, operative in 1913.

The breviary is divided into four parts—a winter, spring, summer, and autumn quarter. Each part contains (1) the *Psalter—i.e.* the psalms arranged for each day of the week; (2) the ***Proprium de Tempore*** (the proper of the liturgical season)—*i.e.* hymns, antiphons, chapters, and lessons, with responsories and versicles for each day of the church year, including the movable feasts; (3) the ***Proprium Sanctorum*** (the proper of the saints)—*i.e.* prayers, lessons, responsories, etc., for the feasts of the saints; (4) the ***Commune Sanctorum*** (the common of the saints)—*i.e.* lessons, Gospels, responsories, versicles, and antiphons that may be employed for whole groups of saints (Apostles, Martyrs, Abbots, etc.)—and, in addition, the offices of the dedication of churches and of the Blessed Virgin; (5) a supplement containing offices which do not bind the whole church, and are recited only in particular countries. Every day the office begins with matins and lauds, which form together the longest of the seven canonical hours. These are followed by prime, terce, sext, none, vespers, and compline. In religious communities a shorter office is substituted, and in churches the services are usually combined—matins and lauds at 7.30 or 8 A.M.; prime, terce, sext, and none at 9.30 or 10; vespers and compline at 4.

It was on the lines of the breviary that the English order of Morning and Evening Prayer was drawn up. They retain their old features so fully that the English Prayer Book may be regarded as an improved breviary and missal. A strong feature of the modern breviary is the skill and taste which have been brought to bear upon the translation (by Newman, Neale, and others) of the hymns, as shown in the edition of the breviary edited by the third Marquis of Bute (1879). See Grancolas's *Commentarius Historicus in Romanum Breviarium;* Batiffol's *Histoire du Brêviaire Romain* (1893); Bäumer's *Geschichte des Breviers* (1895).

Brevier. See TYPES AND TYPEFOUNDING.

Brewer, city, Penobscot co., Maine, opposite Bangor, on the Penobscot Railway, and on branch lines of the Maine Central RR. The chief industries are shipyards, a tannery, and pulp, paper, and saw mills. Pop. (1910) 5,667.

Brewer, DAVID JOSIAH (1837–1910), American jurist, was born in Smyrna, Asia Minor. His mother was a sister of Justice Stephen J. Field, David Dudley Field, and Cyrus W. Field. He graduated at Yale University in 1856, and from the Albany Law School in 1858. He began practice at Leavenworth, Kan., in 1859; became successively judge of the Probate, District, and Supreme Courts of Kansas, and in 1884 was made judge of the U. S. Circuit Court for the Eighth District. In 1889 he was appointed Associate Justice of the U. S. Supreme Court. In 1896 he was a member of the Venezuela Boundary Commission; in 1899 of the British-Venezuelan Arbitration Tribunal; and in 1904 was president of the International Congress of Lawyers and Jurists in St. Louis. Six colleges and universities conferred upon him the degree of LL.D. His great learning, ability, and fairness of judgment were widely recognized. He wrote: *The Pew to the Pulpit* (1897); *Twentieth Century from Another Viewpoint* (1899); *American Citizenship* (1902); *The United States a Christian Nation* (1905).

Brewer, EBENEZER COBHAM (1810–97), English writer, born in London. He is best known as the compiler of the *Dictionary of Phrase and Fable*, *Reader's Handbook*, *Dictionary of Miracles*, and *The Historic Note Book.*

Brewer, JOHN HYATT (1856), American organist and composer, was born in Brooklyn, N. Y. He studied under local masters, including several years with Dudley Buck. He was organist of several Brooklyn churches until 1881, when he became organist and musical director of the Lafayette Avenue Presbyterian Church, a position he still holds (1911). In 1899 he became professor of music in Adelphi College. He was also a co-founder of the Apollo Club of Brooklyn, and was elected conductor to succeed Dudley Buck in 1903. He is conductor of the Flatbush Glee Club. Author of numerous and varied compositions, including several cantatas.

Brewer, JOHN SHERREN (1810–79), English historical writer, was professor of classical literature (1839) and of English literature (1855) at King's College, London; and edited the *Standard* for a short time. In 1856 he began a calendar of *State Papers* (4 vols., 1856–76) of Henry VIII. The prefaces to the various volumes have been edited by Gairdner (1884), under the title, *The Reign of Henry* VIII.

Brewer, THOMAS MAYO (1814–80), American naturalist, was born in Boston, Mass. He graduated at Harvard (1835) and at the Massachusetts Medical School. He was editor of the Boston *Atlas* from 1840 to 1857. His ornithological publications include an edition of Wilson's *Birds of North America* (1839), edited, with additions, by himself. In 1874 he began the publication of *History of North American Birds*, which contains matter supplementary to Audubon's work, and of which he was editor-in-chief. The work was completed by other hands after his death.

Brewer, WILLIAM HENRY (1828–1910), American agricultural educator, was born in Poughkeepsie, N. Y. He was graduated (1852) at the Yale Scientific School, and studied at Heidelberg and Munich. He held chemistry professorships in various colleges; member of the geological survey of California (1860–4); professor of agriculture at the Sheffield Scientific School, Yale, from 1864 till his death. He did considerable exploring in the Sierras and in Arctic regions, and was one of the founders, and for some time president, of the Arctic Club of America. He published numerous scientific papers, principally concerned with the chemistry of agriculture.

Brewing, the process by which malted grain is treated with hot water to produce a wort. This is boiled with hops, filtered, and cooled, and is then made to undergo alcoholic fermentation. In the preparation of native beers, such as *bousa* (Abyssinian beer), *samshoo*, and others, spontaneous fermentation is allowed; but in civilized countries the greatest care is taken to prevent that process. Beer is a beverage of the most remote antiquity. The Egyptian god Osiris is said to have taught mankind to make a drink from barley not much inferior to wine. Isidorus (5th century A.D.) describes the method employed by the ancient Britons: 'The grain is steeped in water and made to germinate; it is then dried and ground, after which it is infused with water, which, being fermented, becomes a pleasant and intoxicating drink.

Only since the middle of the 19th century has beer been brewed on scientific principles. This change is due to the great advances made in chemistry, bacteriology, and agriculture. Of all the members of the grass family, barley has been found the most convenient for the manufacture of beer; and for this in Europe the two-rowed barley and in America the six-rowed varieties are mostly used. Some of the most important European barleys are: Chevalier, Imperial, Champion and Hanna barleys, and the most important barley varieties of America, the Montana, Canada, California, Wisconsin, Dakota, Michigan and New York state barleys. When fully matured these barleys vary greatly in appearance. They are bright and yellow in color, but while the two-rowed varieties are large, plump, and thin-skinned, the six-rowed barleys are smaller in size and have a thicker husk. In weight they average from 50 to 56 lbs. per bushel, and yield a malt of from 36 to 42 lbs., showing a loss of about 25 per cent. in the process, due mostly to increase in volume during malting. Barley is used in preference to other cereals for the following reasons: it germinates rapidly and readily; the growth of the acrospire (plumule) is within the husk; it yields a starch comparatively free from fatty matter; it contains a relatively high proportion of suitable nitrogenous matter and a large amount of starch.

Light chalky and dry gravelly loams, or medium to light soils, produce the best malting barleys; but much depends on the season and climate, which should be warm and rather dry. Strong lands and soils rich in humus produce heavy crops of coarse barleys; while heavy and clayey soils yield a dull-looking barley, which contains too high a percentage of glutinous matters.

Malting.—Two systems are in general use—the old *flooring* and the *pneumatic.* The chief objects to be attained in malting are:

(*a*) the modification or rendering naked of the starch cells; (*b*) the development of the diastatic, proteolytic, and other enzymes present in the grain; and (*c*) alterations of a physical nature by growth of the acrospire and rootlets. These changes are brought about by germination under starvation conditions

Analysis of Two Samples of Malting Barley.

Constituents.	Percentage.	
	(1.)	(2.)
Starch	57.98	63.51
Nitrogenous matter	11.74	11.46
Water	12.19	13.06
Cellulose	10.51	7.28
Gums, sugars, pectins, coloring matters, etc.	2.83	1.34
Fatty bodies	2.17	1.03
Ash	2.58	2.32
Total	100.00	100.00

Common Floor Malting.—The barley as it comes from the elevator contains much dust, seeds from other plants, injured kernels, and kernels of other cereals. It is therefore necessary to clean the barley, separate and grade the kernels according to size, and, if desirable, wash it. This is done by machines known as 'barley cleaners' and 'separators.'

Steeping.—Steeping is the process of soaking barley with water, and is performed by immersing the grain in the steep-tank for a period of time under certain conditions. It aims to impart to the grain sufficient moisture to start and carry on germination, and also to dissolve from the husk the coloring matter and other extractive substances, which otherwise would give the barley a raw taste. The best water for steeping is a medium hard, pure spring or well water. The temperature of the water should not exceed 55° F.; otherwise, mouldy growth will be encouraged. In winter the water should be warmed to the proper temperature before it is run into the steeping tanks. The period of steeping generally varies from 40 to 60 hours and depends upon the character of the water—whether soft or hard—the temperature of the water and the nature and age of the grain. When the barley has reached the desired degree of steeping it is sent to the germinating department. In the modern malt-house the steep-tank is provided with a conical hopper bottom situated above the malt-floor, so that the grain slides down on the floor in a heap. The first heap is called a 'couch.' The 'couch' is set on one end of the floor and the malt gradually works over towards the opposite end, at which the dry kiln is situated. The chief points to be observed in carrying on germination are, sufficient moisture, suitable temperatures, and ventilation. Growth should not proceed too rapidly; the saving of time thus effected influences unfavorably the quality of the resulting malt, especially its mellowness. At advanced stages of development sprinkling is resorted to in order to provide the necessary moisture for further growth. After the acrospire has developed to about ¾ of the length of the kernel and the radicles to about 1½ the length of the kernel and the proper degree of mellowness has been reached the growth is restricted as promptly as possible. The time of germination varies from five to eight days. The further growth of the grain is arrested by expelling a large percentage of the moisture in the green malt. The green malt is conveyed directly into the kiln, the kiln having almost invariably two floors, one above the other. The grain is dumped on the upper floor and there dried slowly to the requisite degree of dryness. Green malt contains about 35 to 40 per cent. of moisture and the air dried malt from 12 to 15 per cent. While the malt is on the upper kiln floor the temperature should be kept comparatively low (75–90° F.) until the moisture has been for the greatest part expelled. After the desired degree of dryness has been obtained the malt is dumped on the lower kiln floor. The regulation of temperatures on the lower kiln floor is governed by the desired quality of the final product. The initial temperature here should be 120–130° F. until the malt is absolutely dry. Then the temperature is raised within two hours to the final temperatures and kept there for two to three hours. The final temperatures for pale malt should be from 165–180° F.; for high dried malt, up to 220° F. The period of kiln drying varies from 36 to 72 hours. The charge on a kiln floor is usually 2,500 bushels in the larger malting establishments, or 5,000 bushels on both floors. The turning on the kilns is mostly done by machinery.

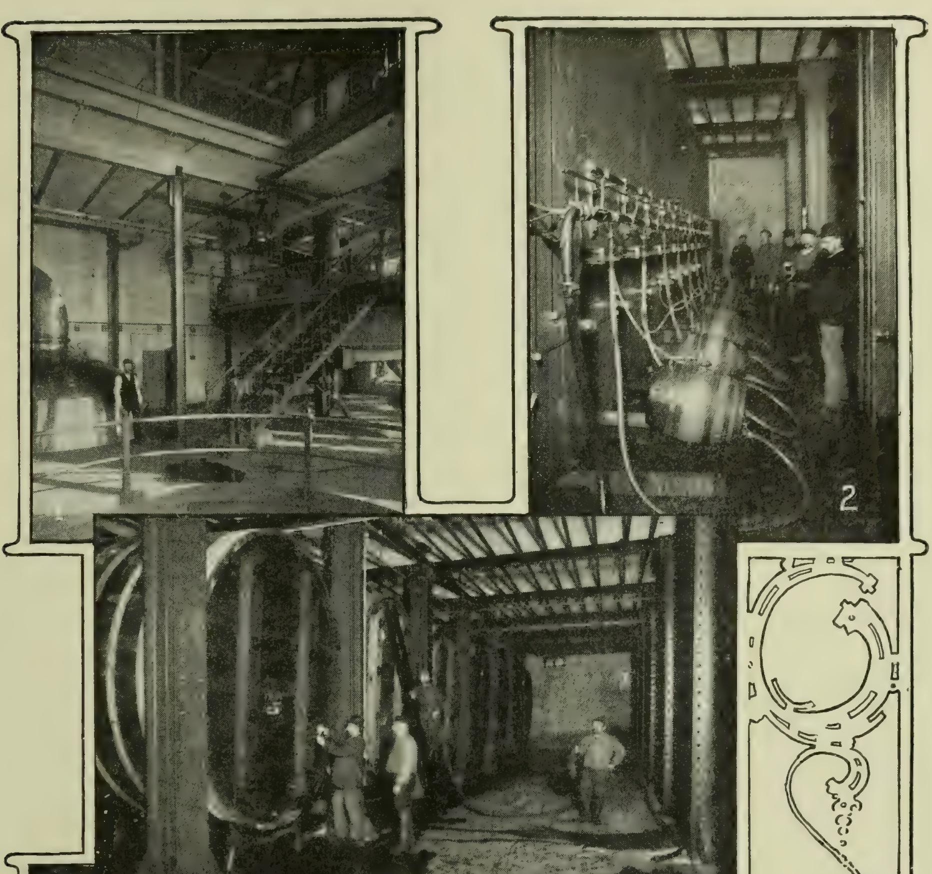
The differentiation between barley and malt may be best illustrated as follows: The loss in cleaning varies from 0.5–2.0 per cent.; loss in skimming from 0.1–4 per cent.; loss in sprouts from 2.8–3.2 per cent.; loss of extract from 4.6–6.8 per cent. and the loss of moisture on kiln from 7.1–7.7 per cent.; so that from 100 lbs. of barley 75 to 84 lbs. fresh kilned, dried malt with 3 per cent. moisture are obtained.

Pneumatic Malting.—Of pneumatic malting the two more important systems are those of Galland (drum malting) and Saladin (pneumatic floor malting). There is very little difference in steeping for pneumatic malting and steeping for floor malting. In the drum malting after the desired degree of steeping is reached the grain runs into the drum which is located on the floor below right under the steep tank and calculated to hold just one full charge of the tank. A steep tank generally holds from 250 to 500 bushels. When the drum is filled it is started revolving. The temperatures in the drums are regulated by increasing or reducing the draught of air. The drum is connected with an air-shaft leading from the atomizing room where the air is drawn through coke and water so as to be charged with the necessary moisture and having correct temperatures; the air is drawn through the drum by means of a fan. While in the drum, the grain is sprinkled by means of mechanical self-regulating sprinklers at suitable intervals. The time it remains in the drums varies from five to eight days, the last day being given to air-drying or withering. The malt is then conveyed from the drum into the kiln and the kilning process carried out in the same manner as for floor malting.

Pneumatic Floor Malting.—In pneumatic floor malting the steep is discharged into a compartment instead of into a drum. In the compartments the malt lies about 30–36 inches in depth on the perforated floor and draughts and fans are set in operation and the air drawn through the malt. The velocity of the draught and the saturation with moisture must be regulated to suit the condition of the 'piece.' The malt is turned by means of 'turners' and sprinkled when necessary.

Brewing Process.—Brewing operations embrace the production of the wort from the raw materials; they include all the operations from the cleaning of the malt up to the point where the yeast is added to the wort in the settling tank or fermenting vat. The selection of the methods to be employed to produce beer depends upon the quality and character of the finished product. The character or properties of a beer necessarily depend upon its composition, that is, the amount and nature of the various substances present in the beer.

Process of Mashing.—Mashing is the process of extracting the goods by mashing them with water at suitable temperatures



AN AMERICAN BREWERY.

1. Brewhouse. 2. Racking Apparatus. 3. Chipcask Cellar. 4. Brewhouse, Mash-tub. 5. Washhouse.

and in proper relative quantities preparatory to the boiling in the kettle. Chemically, it proceeds in the main by the inversion of the malt into maltose, malto-dextrin, and dextrin, and the modification of the insoluble albuminoids into a soluble form. These changes are brought about by the agency of enzymes contained in the malt, which begin operations when the malt is mixed with water at proper temperatures. These enzymes are called diastase and peptase. It is the function of the diastase to convert the starch and of the peptase to modify the albuminoids of the malt. The amounts of dextrin, malto-dextrin and maltose, as well as of modified albuminoids, like albuminoids, peptones and amides, finally present in the wort, are materially affected by the condition under which the enzymes do their work; hence it is in the power of the brewer to control the composition of the wort within certain limits. The method of mashing to be followed is determined by the requirements as regards the character of the beer. If it is desired to obtain a beer with a high degree of palatefulness and foamkeeping capacity, the brewer must understand how to incorporate into the wort the desirable albuminoids and unfermentable extractive substances upon which these properties depend. This can be done by peptonizing at low temperatures —for instance, 100° F.—for one hour and converting the starch at high temperatures—for instance, 154–167° F.—and raising the temperature rapidly between 100° and 154° F., so as to avoid the formation of too much maltose. If we wish to obtain beers with a high percentage of alcohol, we should keep the mash for a sufficient length of time at between 122 and 140° F., at which temperatures maltose is mainly formed. The mash should be so conducted as to secure the desired composition of the wort and to obtain the largest yield possible of extract from the goods employed:

Mashing System.—

(1.) Infusion or Water Mash:
American Beers—From lower initial temperatures to higher final temperatures; English Beers—High initial temperatures.

(2.) Decoction and Thick Mash:
German Beers.

By the infusion method the mash is brought to its final temperature by the addition of water of a suitable high temperature; by the decoction method part of the mash itself is raised by boiling and then returned to the mash-tub. The American raw material method is a combination of both, as the raw grain is boiled separately and run into the malt mash to produce the final temperature. Malt contains diastase in quantities sufficient to convert more starch than is stored up in the malt itself. Anton Schwartz was the first in this country to advise the employment of rice and corn in conjunction with malt. With but few exceptions in the United States rice and corn are used as malt substitutes. In reference to the quantity of these unmalted cereals, it may be stated that from 25 to 40 per cent. of the malt may be replaced by these raw materials. These unmalted cereals are mashed in special vessels with part of the malt at temperatures ranging up to 167° F. The starch is rendered soluble by boiling. The vessels used for the conversion of the unmalted cereals are made of wood or iron, and are supplied with good stirring apparatus. These converters are furthermore provided with steam coils or steam jackets for indirect steaming, or the temperature is raised by direct steam. Besides these unprepared cereals some products are used which can be added directly into the mash-tub, as they have been previously prepared by steaming and rolling; such products are known as 'frumentum' and 'cerealine.' The use of these raw materials enables the brewer to produce a beer of paler color, better stability, and to work more cheaply. The amount of materials to be used per barrel of beer depends upon the gravity and strength of the wort and the yield of the material. The brewery yield will never be as high as the laboratory yield, but it should approach it within 2 to 3 per cent. A good quality of malt should yield 64–65 per cent. of extract, a good corn from 76–78 per cent., and corn flakes and rice from 78–80 per cent.

Malt beers are brewed from 12–15 per cent. Balling and require from 50 to 65 lbs. of malt; pale Lager beer should be brewed from 12–13 per cent. Balling and require from 48 to 53 lbs.; pale bottle beer should be brewed from 13–15 per cent. and require from 52 to 60 lbs. of material; temperance beers are brewed with from 7–8 per cent. Balling; malt tonics are brewed from 8–15 per cent. Balling.

After the mashing process is completed and a wort of the proper composition is obtained the mash is allowed to rest for the purpose of permitting the grains to settle well, so as to form a good filtering material and allow the wort to run off quickly. As a rule, the mash is kept on rest for about one-half hour. But it is well to be guided by other conditions when fixing the time of resting; such conditions are: the construction of the mash-tub; the condition of the false bottom; the kind of materials employed.

Filtration of the Wort and Sparging.—A good filtration of the wort depends upon the quality of the malt, the conversion, and the grinding of the malt; also upon the arrangement of the drawing pipes. Very fine grinding, incomplete conversion and a too vertical position of the drawing pipes render the filtration of the wort more difficult. With a brewing plant of large size 100 barrels per hour is to be considered good work. The first portions of the wort are returned to the mash-tub until the wort runs perfectly clear, and then brought into the kettle. The first wort is allowed to run off until the surface of the wort is only two to three inches above the grains. Then sparging begins. The objects of sparging are, to wash out the extract from the grains. Two kinds of sparging devices are now in use, the 'rotary' and the 'ring spargers,' of which the latter is most generally employed. It consists of a stationary, bent, copper tub placed near the top of the mash-tub, having holes drilled through its lowest side in such a direction that the water is evenly distributed over the surface of the grains.

Boiling of the Wort and Addition of Hops.—The wort obtained by mashing is boiled for the purpose of: (1) coagulation of the albuminoids, that is, break of the wort; (2) evaporation of water, consequently concentration of the wort; (3) extraction of hops. The wort is generally heated by steam, open fire kettles having gone quite out of use. The time of boiling varies from 1½ to 2½ hours.

Hopping the Wort.—The hop cones which are used in brewing contain between their leaves a yellowish hop-flour — the so-called lupuline—which contains the active principles of hops; namely, the aromatic oil and the resinous and bitter substances. The leaves of the hop cones contain the tannic acid and some of the effective constituents, but no valuable substances are contained in the seeds of the hop-cones. The latter contain substances which, when extracted, may impart a harsh taste to the beer. Good hops should be of greenish yellow color, and silky to the touch; they should be of a slightly glossy appearance, should contain as few seeds as possible, and should be picked clean, that is, free from leaves and stems

The hops are added in different portions, in order to secure both the bitter and aroma. The quantity of hops depends upon the quality of the hops and the preference of the public for a more or less bitter beer. As a rule, from ¾ to 1 lb. are added per barrel for ordinary draught beer; from 1 to 1½ lbs. per bbl. for pale beers; and from 2 to 2½ lbs. per bbl. for special beers. From the kettle the beer runs into the 'hop-jack,' where it is allowed to stand for a period of about 15 minutes, to permit the hops and albuminoids to settle. The wort is then pumped into the surface cooler for the purpose of preliminary cooling. From the surface cooler the wort is sent over the Baudelot Cooler which consists of a series of pipes arranged in vertical tiers over the outside of which pipes the wort is allowed to flow, while through the insides of the pipes the cooling medium is circulated. The wort should not be cooled lower than 145° on the surface cooler, as below such temperatures the development of disease ferments is favored, which ordinarily will act unfavorably on the quality, flavor, and stability of the product. Of late, closed coolers have been installed, in which the beer is cooled without coming in contact with the air, except such as has been previously filtered and sterilized. After the wort has been cooled to the proper temperature it is ready for pitching with yeast.

Fermenting Cellar Operations.—With reference to the character of the beer to be produced, as far as determined by the process of fermentation, two methods of conducting fermentation are distinguished:

(1.) Top fermentation, for ale, stout, and porter;
(2.) Bottom fermentation, for lager beer.

Bottom fermentation proceeds at low temperatures, viz., 42–51° F.; top fermentation at higher stages, from 58–68° F. The designations for the two types of fermentation are derived from the fact that in bottom fermentation the yeast for the most part settles to the bottom, whereas in top fermentation it rises to the surface. Fermentation is induced in the wort by adding yeast, which operation is called 'pitching.' The wort runs from the Baudelot Cooler generally into a collecting vat, where fermentation is started. The method generally used for conducting the fermentation of lager beer is as follows: The wort is generally started at 45–46° F., about one pound of thick yeast being taken for each barrel of beer. After about 24 hours a white frothy cover will indicate that the fermentation has started and at this stage the fermenting beer is generally brought into the fermenting vats. In all cases fermentation must be so conducted that the natural rise of temperature and the fermenting power of the yeast is not checked in any way. In the fermenting room which is kept at a temperature of 41° F. the fermenting beer is allowed to reach the temperature of 51–55° F. and artificial cooling by means of attemperators is begun only after the fermentation begins to recede. The beer is cooled off gradually and uniformly, so that when the fermentation is finished the fermented beer will have a temperature of 36–39° F. The time of fermentation varies from eight to ten days for lager beer and from four to six for top fermentation beers.

The substance by the agency of which fermentation is carried on is called 'yeast.' The cause of fermentation as performed by the yeast depends upon the vitality and environment of the yeast, temperature, aeration, composition of wort, presence and absence of foreign ferments, and upon the type of yeast employed. Good yeast has a thick, stiff, pasty consistency of a yellowish to brownish color, a bitter taste and a characteristic odor. It consists of single cell organisms of the class Saccharomyces Cerevisiæ. The yeast, after fermentation is over, will settle to the bottom, and the fermented beer is brought into the Ruh tanks, where the beer is stored for four to eight weeks—sometimes longer. The objects of storing the beer are, to eliminate certain suspended matters like yeast, thereby securing greater clearness and greater durability. Low temperature while the beer is on storage is necessary to precipitate the proteids and to check the development of bacteria. The storage cellars should be kept as near to 32° F. as possible. When sufficiently matured in storage the beer is run into chipcasks, so-called from the method of clarifying beer by means of chips. The treatment in the chip-cellar has a twofold object: (1) to impart to the beer the necessary life, that is, a sufficient amount of carbonic acid gas so that it will foam properly when tapped; this is done either by kraeusening or by charging with carbonic acid gas; (2) to make the beer brilliant by the addition of chips and isinglass, and by filtration. Kraeusening consists in the addition of young beer in the first stage of fermentation twenty to twenty-four hours after pitching. When the fermentation in the chipcasks has proceeded for some time the cask or vat is bunged, and the carbonic acid gas which still develops is absorbed by the beer. The quantity of carbonic acid gas absorbed by the beer depends upon the temperature and the pressure; the lower the temperature and the higher the pressure, the greater the amount of carbonic acid gas which will be absorbed. The usual conditions are as follows: The temperature of the chipcask cellar should be kept at 36°–37° F. and the beers subjected to a pressure of about five to six pounds. The pressure is regulated by bunging apparatus, which may be either simple pressure valves, one being used for each cask independent of one another, or the valves terminate in a joint-pipe connection which at its end is supplied with a pressure regulator. These bunging apparatus are so constructed, that when too much carbonic acid gas is generated, the surplus which cannot be absorbed by the beer at the prevailing temperature escapes through the valve. Under ordinary conditions 12–15 per cent. of kraeusen are used; in special cases as much as 25 per cent. are employed. For bottle and export beer the quantity of kraeusen should be reduced to as low as 6 per cent. The quantity of kraeusen is generally influenced by the nature of the Ruh beer; long-stored, low-fermented beers need a larger addition of kraeusen than younger beers which are less fermented. As kraeusening decreases the stability of the beer, it has been found practical to charge the beer with carbonic acid gas (carbonating).

The carbonic acid gas is generally introduced into the beer on its way from the chipcask to the filter. The successful manipulation of carbonating is more difficult than kraeusening, as much depends upon the composition of the wort, the temperature of the beer, and the pressure of the gas. However, with proper precautions and care, equally good results have been obtained. For carbonating either the artificial, pure carbonic acid gas is used, or the carbonic acid gas collected from the fermenting tubs in the brewery. The latter system is the more practical; in such cases part of the fermenting tubs are closed and the fermentation goes on under a slight pressure. The carbonic acid gas which develops during fermentation is drawn off, washed and compressed and used for carbonating, or sold for other purposes. The quantity of carbonic acid gas generated in the brewery during fermentation is about twenty times as large as the amount necessary for carbonating the beer, so that a large surplus is always at the disposal of the brewer. After the beer has absorbed the necessary amount of carbonic gas and is sufficiently bright, it is ready for racking.

Owing to the great demands of the public in regard to the brilliancy of the product, nearly every brewery employs filters. The filtering process consists in forcing the beer generally by means of air pressure applied at the chipcask through one or more layers of compressed, fibrous material called 'filtermass,' which commonly consists of wood pulp or paper pulp. Sufficient counterpressure is maintained at the racking bench, as otherwise the beer would foam strongly and too much carbonic acid gas be lost; for this reason counterpressure apparatus are employed and the small vessels are filled with compressed air before the beer enters. The beer will then enter a space which is not only under atmospheric pressure, but kept at a high pressure, and consequently foaming will be reduced to a minimum. The lager beer is now ready for consumption.

Ale and Porter.—Ordinary ale (present use or green ale) as well as lively ale and flat ale, are brewed with a concentration of 13–16 per cent. Balling, while the better ales have an original gravity of 16–18 per cent. Balling. Lively ale possesses a strong foaming capacity, and flat ale or still ale is almost entirely without foam. For mashing the 'downward infusion method' is generally employed. The boiled and hopped wort is cooled to about 58–60° F. and brought to fermentation at this temperature. As a rule, ale is hopped more strongly than lager beer, 1–2 lbs. being taken for every barrel; in some cases, especially for heavy ales, 2–4 lbs. are used; ½ lb. of yeast is taken for pitching. The temperature during fermentation should not exceed 66° F. About 48 hours after pitching the first covers are removed, and this is repeated every 8 to 12 hours until no more yeast rises to the top. The first cover, and eventually the second one also are dirt covers and are thrown away, but, as soon as the yeast is pure and thick, it is kept for future use. About four days after pitching the main fermentation is finished and the yeast ceases to work. As soon as the fermentation becomes less vigorous the temperature of the ale should be lowered, and should be about 58° F. at racking. Lively ale is generally racked before it is wholly fermented, when it shows an apparent degree of attenuation of 55 per cent. and still contains about 3 per cent. of fermentable sugar. Flat or still ale should be wholly fermented, and is stored for some time in storage vats before it is ready for the market. The method of carbonating and filtering ale is now in use with great success, and a product known as sparkling ale is on the market which possesses the characteristic taste and odor of the ale and equals lager beer in life and brilliancy. Carbonated ales are best adapted for bottling, and keep well.

East India Pale Ale.—As a rule, East India pale ale is a flat ale brewed with about 17–18 per cent. Balling, and conspicuous for its particularly fine hop aroma; 2 to 3 lbs. of hops are added per barrel in the kettle and a further ½ to 1 lb. is added at the time of racking.

Porter.—Porter is brewed and fermented in the same manner as ale, and, as a rule, shows an original gravity of 15–16 per cent. About 15–20 per cent. of the material which is used represents color malt.

There are two kinds of porter —lively porter and still porter. Lively porter is racked into shipping packages immediately after fermentation; still porter is allowed to ferment completely, and it is either stored in tubs or small packages which are provided with porous bungs. The main difference between lager and ale is in the methods of mashing, the character of the yeast, and the temperatures during fermentation.

Steam Beer.—Steam beer is brewed in some of the Western states, especially on the Pacific coast, and is only of local interest. The characteristic properties of this beer are: very much life and a prickly, slightly acid taste. Malt only, but in some cases malt adjuncts, is used in the preparation of this beer. The beer is brewed with a gravity of about 13–14 per cent. Balling, and in the kettle about 1 lb. of hops is added per barrel. This is a bottom fermenting beer, but the fermentation is conducted at high temperatures. The temperature at pitching is from 56–62° F. (generally 58–60° F.), and ½ lb. of lager beer yeast is used for every barrel of wort; 24 to 32 hours after pitching, when the beer is in the state of high kraeusen, it is pumped over on the so-called clarifiers, where it remains from three to five days until the main fermentation is finished. These clarifiers are flat wooden tubs which resemble the surface coolers. Before the beer is pumped over on the clarifiers, the covers are removed, and this is repeated once or twice while the beer is on the clarifiers.

After the main fermentation is finished, the beer is racked immediately into the shipping packages; from 1–6 gallons of kraeusen are added per barrel, and sometimes the beer is slightly fined before it is bunged. At the consumer's, the beer must lie for several days before it is ready for consumption. It spoils very easily, and for this reason some powerful preservative should be added.

Weiss Beer.—Weiss beer is a top-fermenting beer which is in a high state of strong after-fermentation, and which possesses much life and a prickly, somewhat sour taste. It is prepared from barley malt and wheat malt, usually ⅓ wheat malt, but in some cases more. The beer is brewed with about 9–10 per cent. Balling and is hopped but slightly, about ½ lb. of hops being taken per barrel. Weiss beer is brewed after different methods. In some cases it is prepared by the infusion method, in others by the decoction method, whereby the hops are boiled in the kettle with part of the mash. Sometimes the hops are boiled separately and the resulting liquor is added to the mash.

If much wheat is used, the mash is run over straw which has been treated with boiling water, and the wort is brought immediately upon the surface cooler where it is cooled down to 59–68° F. Only Weiss beer yeast should be taken for pitching, so that the characteristic taste of the beer will be obtained; fermentation will begin after a few hours and the dirt covers should be removed carefully. The beer is then filled into kegs and shipped. The kegs should be leaned over to one side, and after six to eight hours a foam cap will have worked out; this is the so-called 'hop-beer,' which is allowed to run out and is collected in vessels which have been placed below. Then the yeast begins to be more active, and when the main fermentation is finished, which is usually after 44 to 48 hours, the kegs are again filled up with hop-beer until the yeast has settled to the bottom. Then the beer is drawn into bottles or stone jugs, where an after-fermentation takes place until the beer is ready for consumption.

In 1904 the total output of beer in the United States was 48,208,133 barrels. The internal revenue tax on beer in the United States is one dollar per barrel.

See Thausing's *Theory and Practice of the Preparation of Malt and the Fabrication of Beer* (1882); Dr. Sykes's *Principles* *and Practice of Brewing;* Moritz and Morris' *Science of Brewing;* Carl Oppenheimer's *Ferments and Their Actions* (Eng. trans.); Southby's *Practical Brewing;* E. Hantke's *Handbook for the American Brewer and Maltster;* Baker's *The Brewing Industry* (1905); Wahl-Henius' *American Handy Book of the Brewing, Malting, and Auxiliary Trades* (1908); Arnold's *Origin and History of Beer and Brewing* (1911).

Average Composition of American Beer.

	Per Cent.
Specific gravity	1.01648
Apparent extract	4.19
Real extract	5.72
Alcohol	3.42
Sugar	1.71
Proteids	0.42
Total acids	0.22
Ash or mineral matter	0.26
Phosphoric acid	0.07
Extract of original wort	12.56
Apparent degree of attenuation	66.64

Average Composition of Ale (India Pale).

	Per Cent.
Specific gravity	1.02102
Apparent extract	5.25
Real extract	7.54
Alcohol	5.11
Sugar	3.24
Proteids	0.52
Total acid	0.28
Ash or mineral matter	0.36
Phosphoric acid	0.08
Extract of original wort	17.77
Apparent degree of attenuation	70.44

Brew'ster, BENJAMIN HARRIS (1816–88), American lawyer, was born in Salem county, N. J., and was graduated from Princeton (1834). He was admitted to the Philadelphia bar, and became a leader in his profession. He was attorney-general of Pennsylvania in 1867–9, and Attorney-General of the United States in 1881–5, when he conducted the 'Star Route' trials with great skill and determination (see STAR ROUTE FRAUDS).

Brewster, CHAUNCEY BUNCE (1848), American bishop, was born at Windham, Conn., and was graduated from Yale (1868). He was ordained a priest in the Protestant Episcopal Church (1873), and was rector of churches at Rye, N. Y., Detroit, Baltimore, and Brooklyn. In 1897 he was consecrated coadjutor bishop of Connecticut, and succeeded as bishop two years later. He has published; *The Key of Life* (1894); *Aspects of Revelations* (Baldwin Lectures for 1900); *The Catholic Ideal of the Church* (1905); *The Kingdom of God and American Life* (1912).

Brewster, SIR DAVID (1781–1868), Scottish natural philosopher, was born at Jedburgh, and was educated at the University of Edinburgh. In 1802 he became editor of the *Edinburgh Magazine,* and in 1808 of the *Edinburgh Encyclopædia.* In 1813 he published a *Treatise on New Philosophical Instruments;* and in the following year he commenced a series of papers contributed to the Royal Society on the *Polarization of Light,* for which he was awarded the Copley medal, afterward receiving the Rumford and Royal Medals also. In 1816 the Institute of France adjudged to him the half of the prize for physics of 3,000 francs awarded for the two most important scientific discoveries which had been made in Europe during the two previous years; and in the same year he invented the kaleidoscope (q. v.), which, though patented, obtained for him more fame than remuneration. He afterward divided with Wheatstone the merit of introducing the stereoscope (q. v.), by means of his lenticular instrument.

Along with Professor Jameson Brewster founded the *Edinburgh Philosophical Journal* in 1817, and afterward the *Edinburgh Journal of Science.* His next work, *An Account of a New System of Illumination for Lighthouses* (1827), the dioptric system, was not crowned with success till 1835, with the Inchkeith lighthouse. In 1831, in conjunction with Herschel, Babbage, and other kindred minds he originated the British Association, and in the same year was knighted. He was appointed principal of the united colleges of St. Salvator and St. Leonard at St. Andrews in 1838, and was chosen president of the British Association in 1849. In the latter year he was elected one of the eight foreign associates of the French Institute. He became principal of the University of Edinburgh in 1859. Among his general works may be mentioned: *Martyrs to Science* (1841); *More Worlds than One* (1854); *Life of Newton* (1828; new ed. 1855); *Letters on Natural Magic* (1831). Consult *The Home Life of Sir David Brewster,* by his daughter, Mrs. Gordon, which contains a complete list of his writings.

Brewster, WILLIAM (*c.* 1560–1644), one of the *Mayflower* pilgrims, was born at Scrooby, England. He was educated at Cambridge and became postmaster of his native place. Strongly influenced by the Puritan doctrines of the times, he withdrew from the Established Church, and formed a society which met for worship at his house. Persecution, however, drove the members to seek a refuge in Holland, but they were seized before they could embark, and imprisoned. Obtaining his release with difficulty, and shorn of most of his means, Brewster made his way to Leyden, where he supported himself by teaching English. He sailed with the *Mayflower* in 1620, and acted as pastor to the church at Plymouth, though he could not be persuaded to administer the sacraments. Consult Steele's *Life and Times of William Brewster.*

Brezova, Hungary. See ZOLYOM-BREZO.

Brialmont, brē-äl-môṅ', HENRY ALEXIS (1821–1903), Belgian general and writer on fortification, was born at Venlo. Entering the army in 1843, he was in 1847 intrusted with the fortification of Diest. In 1859 he planned and constructed (1860–70) the strong fortifications at Antwerp. In 1877—two years after his appointment as inspector-general of Belgian fortifications—on the invitation of the Roumanian government he went to Bucharest to devise a system of fortifications for that country; and in 1885 he made a second visit. The works, begun in 1886, were completed in 1899. Meanwhile Brialmont had finished plans for the fortification of the Belgian frontier along the Meuse (1860–70). In 1883 he submitted a plan for fortifications in Greece, at the request of the Greek government, and four years later retired from active service. Among his more important books are: *Histoire du Duc de Wellington* (1856–7); *Système de Défense de l'Angleterre* (1859); *Etudes sur la Fortification des Capitales et l'Investissement des Camps Retranchés* (1873); *La Fortification du Champ de Bataille* (1879); *La Fortification du Temps Présent* (1885); *Influence du Tir Plongeant et des Obus-Torpilles sur la Fortification* (1888).

Bri'an (926–1014), famous king of Ireland, known as Brian Boroimhe (Boru), or 'Brian of the tribute,' defeated the Danes at Sulcoit, near Tipperary (968), fighting under his brother Mathgamhain, who had possessed himself of the kingship. After his brother's murder (976), Brian seized the kingship, allied himself with Maelsechlainn or Malachy, chief king of Ireland, defeated the Leinster men (984) and the Danes of Dublin, and finally seized Tara and subdued Maelsechlainn himself (1002). He then made a triumphal circuit of Ireland, receiving hostages from all the tribes. Thus he had become *Ard-Righ na Erenn,* chief king of Ireland, and such he remained until his death. He was slain at the Battle of Cluantarph or Clontarf (April 23, 1014), where the power of the Danes, however, was effectually broken.

Briançon, brē-äṅ-sôṅ' (ancient *Brigantium*), capital department of Hautes-Alpes, France, on the Durance; 37 miles by rail northeast of Gap. It is a fortress of the first class, and the most elevated town (alt. 4,330 feet) in France. There are silk and Briançon chalk industries, and coal is mined in the neighborhood. In 1788 the town withstood a three-months' siege of the allies. Pop. (1911) 7,888.

Briand, brē′ȧnd′, Aristide (1862), French statesman, was born in Nantes of a prosperous bourgeois family, and was educated in the local schools. He studied law, became interested in politics, and entered the field of journalism, contributing to the anarchist organ *Le Peuple, La Lanterne,* and *Petite Republique,* and founding with Jean Juarès *L'Humanité.* At the Congress of Workingmen held in Nantes in 1894 he espoused the cause of labor unionism, and from that time became a recognized leader of the Socialist party. In 1902 he was elected a member of the Chamber of Deputies, where he distinguished himself by his forceful and tactful reporting of the Church and State Separation bill. In 1906 he was made Minister of Public Instruction and Worship, and was thereupon read out of the Socialist party. Two years later he became Minister of Justice. He succeeded Clémenceau as Prime Minister in 1909, and in that capacity checked the great railway strike of 1910 by ordering the strikers to join the colors for three weeks' training, and assigning them as soldiers to run the trains which as civilians they had deserted. He resigned in 1911; was again Premier for a short period in 1913, forming the first Cabinet under President Poincaré; and in October, 1915, during the European War, accepted the Premiership for the third time.

Briansk, brē-änsk′, or Bryansk, town, Orel government, Russia, on the Desna, an affluent of the Dnieper; 75 miles by rail northwest of Orel city. It has an arsenal (founded 1783), cannon foundry, shipbuilding yards (for river navigation), and grain, salt, and wood trade. The Cathedral, built in 1526, was restored in the seventeenth century. Pop. 24,000.

Briare, brē-är′, town, department Loire, France, on the River Loire; 39 miles by rail southeast of Orleans. It gives its name to the canal connecting the Loire and Seine. It has important manufactures of buttons. Pop. (1911) 4,637.

Briareus, brī-ā′rē-us *or* brī′*a*-rūs, or Ægæon, son of Uranus and Gæa, a giant with a hundred hands and fifty heads who helped Zeus conquer the Titans, and guarded them when imprisoned in Tartarus.

Briar Root, a fine hard wood obtained from the roots and knots of the tree heath *Erica arborea,* which abounds in countries bordering on the Mediterranean. It is largely used for tobacco pipes (see Pipes, Tobacco).

Bribery consists in making the offer of any gift or reward to one holding a public office or enjoying a public right, for the purpose of influencing his official conduct or the exercise of his right. The party to whom the offer is made does not require to accept in order to render the offerer guilty of bribery; but if he does accept, he is himself guilty of the same offence. In Oriental countries bribery of all kinds is recognized as an ordinary factor of everyday life, but European races generally have always regarded it as a serious injustice. Perhaps the most reprehensible form is judicial bribery. Bribery of jurymen is regarded in the same light as bribery of judges (see Embracery). Bribery of public officials of any kind is also a crime at common law. In Great Britain an attempt was made to put a stop to commercial bribery by the Secret Commissions Act of 1906.

In international politics also, bribery was in former times extensively resorted to. Charles ii., for example, received large sums from Louis xiv. of France, and the union of the Irish Parliament with that of England was accompanied by gross bribery.

Political bribery is the most insidious form which the offence takes. In Great Britain it was reduced to a regular system under Sir Robert Walpole, in the first half of the eighteenth century, and long continued a serious blot on politics, both in that country and in the United States. Much legislation has been directed in recent times toward stamping out this evil. In particular, drastic measures have been passed, limiting the expenditure of candidates and parties during elections. See Elections; Corruption, Political.

Brice, Calvin Stewart (1845–98), American legislator, was born in Denmark, O., and was graduated from Miami University in 1863, serving in the Union Army before and after graduation. He studied law, and was admitted to the bar. He became interested in railway finance, and acquired large interests in Middle Western railroads. He was a Democratic Party leader, was frequently a member of the National Committee, and was U. S. Senator from Ohio in 1891–7.

Brice, St., bishop of Tours in the fifth century, was brought up in the monastery of St. Martin, near Tours, and succeeded the latter as bishop. His life was somewhat irregular. On his day, Nov. 13, 1002, by the orders of Ethelred ii., the Unready, a great massacre of the Danes occurred, a treacherous act which cost Ethelred his throne.

Brick, a moulded block, usually of burned clay, extensively employed in building construction on account of its comparative cheapness, strength, durability, and ease of transportation and handling.

The use of brick dates from very ancient times, the earliest examples probably being the sun-dried specimens of Egypt, Assyria, and Babylonia, subsequently introduced by the Moors into Spain, and by the Spaniards into Spanish America (see Adobe). Kiln-baked brick is also found in the chief ruins of ancient Babylonia. Most of the great Roman ruins are of brick, and the Romans seem to have introduced the art of brick making into England. All ancient bricks, whether baked by the sun or by fire, were of clay mixed with grass or straw.

Manufacture.—The clay from which common *building brick* is made consists essentially of hydrated silicate of alumina, with a varying proportion of other mineral matter, chiefly free silica (sand), iron, lime, magnesia, and potash. The earth, after being excavated, usually undergoes a process of weathering, which lasts for a period varying from a few days to a couple of months. In the older processes the clay is then moistened and mixed to a plastic state ('tempered'), either in the pit or in a primitive pug mill, and pressed into the moulds by hand. In more modern plants both tempering and moulding are done by machines. These are of two main types, according as they are constructed to work soft mud or stiff mud. In the soft-mud machines the clay, after being well mixed, is forced out between rollers, or by an augur or plunger device, through a die in a compact stream of the desired dimensions, and by means of wires is cut into bricks. In the case of stiff clay the material is fed into the pug mill from a mixer; is forced by knife blades into metal moulds arranged on a revolving table or the circumference of a drum; and as the table or drum revolves the roughly moulded bricks are removed and pressed into shape in a plunger press.

The green bricks, after being carefully dried in the sun or by artificial heat, are usually baked in kilns with a suitable arrangement of fires and flues. These are of four types: (1) single up-draft kilns, consisting of a rectangular space surrounded by brick walls and open at the top; (2) single down-draft kilns, circular or rectangular in shape, and enclosed with masonry on top as well as on the sides; (3) single horizontal draught kilns, in which the fires are built at one end and the hot gases travel horizontally to the chimney at the other end; and

(4) continuous kilns, which are divided into a number of chambers or compartments so built that in some the full heat from the furnace is obtained, while in others the waste gases afford sufficient heat to dry the freshly moulded bricks. The time required for firing in ordinary kilns varies from 40 to 60 hours for common red and white bricks, while for some fire bricks 150 hours are necessary.

Where kilns are not used, the bricks are burned in clamps, a quantity of ground coal sufficient to burn them being mixed with the clay in the process of tempering.

Bricks vary in size, shape, color, and texture. In the United States, the standard building brick is 8¼×4×2¼ inches, as compared with 8¾×4⅜×2¾ in Great Britain. Bricks of special shape and size are made for arches, copings, and ornamental purposes. The color depends largely on the amount of iron present in the clay. Thus, clays containing less than 1 or 1½ per cent. of iron change in the kiln to various shades of cream color and buff, while those containing more than 2 per cent. vary from yellowish-fawn to dark red. The texture should be fine, compact, and uniform. Bricks are also classified according to their method of manufacture, material, and uses.

Fire Brick, which is especially adapted to resist very high temperatures, consists of almost pure clay, or pure clay and sand mixed or, rarely, of silica and clay. The amount of oxide of iron should not exceed 6 per cent., and the combined lime, soda, potash, and magnesia should not exceed 3 per cent. These bricks are used chiefly for lining stoves and furnaces. Among the most refractory of fire bricks are *bauxite* bricks, composed chiefly of alumina and oxide of iron, with a small amount of silica; and *silica* and *ganister* bricks, made chiefly from pure siliceous rock or a highly siliceous fire clay. Special bricks of a basic or neutral character, as *magnesite* and *chromic* brick, are used for furnaces in which slags rich in lime are produced.

Sandlime Brick is made of sand or crushed sandstone cemented together with silicate of lime. It is mixed and moulded much like dry-clay brick, and is hardened under steam pressure. (See Sandlime Brick.) In *cement-sand* brick, Portland or other cement is used as the binding material.

Vitrified Brick, sometimes known as clinkers, is prepared by burning the clay to the point of vitrification, and annealing or toughening by slow cooling. It is used chiefly for paving and in engineering construction.

Glazed Bricks have the surface covered with a special glaze. They are highly useful not only for decorative purposes, but for passages, stables, and other places which require frequent cleaning.

Slate Bricks are made from the débris of slate quarries, and are among the strongest bricks known.

Statistics.—According to the report of the United States Geological Survey, the value of the brick and tile products of the United States for 1923 was $309,631,561. Common brick was valued at $94,472,666; fire brick, including clay and silica fire brick, $46,676,637; vitrified brick or block at $15,569,670; enamelled brick at $1,670,852; ornamental brick at $252,323. Ohio, Pennsylvania, and Illinois are the leading States in brick and tile production.

See Bricklaying; Pottery. Consult A. B. Searle's *Modern Brickmaking* (1911), *Cement, Concrete, and Bricks* (1913), and *Clay and Clay Products* (1915); Scrimshaw's *Bricklaying in Modern Practice* (1920).

Bricklaying is the art of arranging bricks, and embedding them in a mortar of lime or cement in such a way that they will form a structure of a given shape and the necessary degree of stability. A layer or stratum of bricks is known as a *course,* and the arrangement of the bricks in successive courses as the *bond.* Bricks laid with their lengths in the direction of the course, and their sides to the wall face, are called *stretchers;* those laid transversely, with their ends forming the wall face, *headers;* a layer of headers, a *heading course;* of stretchers, a *stretching course.*

Three bonds are commonly used in building construction: *English bond,* consisting of alternate courses of headers and stretchers; *Flemish bond,* of alternate headers and stretchers in the same course; and *common bond,* of from four to seven courses of stretchers to one of headers. The Flemish bond is neater in appearance, and is generally preferred for outer walls when they are not to be plastered. English bond is stronger and more compact, and gives a better transverse tie. To strengthen the bond, bands of iron are sometimes laid between the courses, especially where headers cannot be inserted.

A mortar composed of lime and sand is commonly used for brickwork employed in architectural construction, while for sewer linings, bridge piers, tunnels, reservoir walls, and similar structures a cement mortar is usually employed. The function of the mortar is not only to bind the bricks together, but by taking up inequalities in the brick to distribute the pressure equally throughout the wall, and so fill the spaces between the bricks as to prevent the conduction of heat, sound, and moisture.

The process of bricklaying is best illustrated in wall construction. Walls usually consist of two exterior courses, with one or more interior or filling courses between them. The outside courses are first laid. The mortar is spread with a trowel along a bed for the brick, and a dab of mortar is scraped against the outer vertical angle of the last brick laid. Then the brick, which should be damp or wet, is pressed into place with a sliding motion, so that the mortar is forced into the pores of the brick, and absolute adhesion is guaranteed. (See Mortar; Cement.)

To obviate the constant use of the plumb and level, the bricklayer, on clearing the footings of a wall, usually builds up six or eight courses at the external angles. These he carefully plumbs and levels across. By means of a stretched string, they serve as a gauge for the intervening work.

When the outer courses have been laid to an angle or opening, the space between them is filled with a thick bed of soft mortar, and bricks are pressed into this mortar in a downward diagonal manner. This is technically known as 'shoving,' and the courses are raking courses or herring-bone work, according as the bond is common, English, or Flemish. In exceptional cases the filling courses are laid dry on a bed of mortar, and grout or liquid mortar is poured in. When the wall is completed, the projecting mortar is either scraped off flush with the brick, or 'struck,' so that it slants in order to shed any water which may fall on it.

Brick walls are frequently built hollow, the two 'skins' of brickwork having a few inches of space between them. The skins are tied together at intervals by iron band ties, bent or looped so that moisture is not conveyed to the inner skin. In common brick arches the bricks are either laid upon wedge-shaped joints of mortar, or the bricks themselves are dressed to a wedge shape, in which case the mortar joints are of uniform thickness. See Arch; Masonry.

Bride, St. See Brigit, St.

Bride'well, parish, city of London, England; once contained a famous prison or house of correction, so named from St. Bride's Well, a spring of reputed healing power. It was burned during the great fire of 1666, and was finally demolished in 1863.

Bridge, or Bridge Whist, a game of cards, possibly of Russian origin. It was played in the clubs of Constantinople and Egypt about 1865, and before the end of the nineteenth century had found its way to the Riviera, Paris, Great Britain, and the United States.

Bridge is a game for four persons, two being partners against the other two. Only three persons actually engage in playing the cards, for the dealer's partner exposes his hand on the table and it is played by the dealer in partnership with his own. The game then resolves itself into one of dummy whist (see WHIST).

The dealer distributes the pack singly, without turning up the last one of the pack. The four players examine their hands and the dealer then has the privilege of saying what suit shall be trumps or of passing the selection on to his partner, who is then bound to name the trump.

As in whist, every trick over six taken by one side is scored as an overtrick, but in bridge its scoring value is regulated by the suit that is made trumps (spades 2; clubs 4; diamonds 6; hearts 8; no trumps 12). When the trump suit has been named, it is at the option of either adversary—the one to the dealer's left having priority—to double its scoring value. The dealer who declared trumps, or, his partner, may now redouble, and the other side can redouble until an agreed-on limit has been reached. The player on the dealer's left leads out a card to the first trick, and the dealer's partner then (and not till then) spreads his hand face upward on the table, taking no further part in that hand.

A game consists of 30 points, made up exclusively of *trick* scoring, whether on 'doubles' or otherwise. Should a win carry the score over 30, the surplus points are taken into account when the score is settled at the end of the rubber. The side winning the *rubber—i.e.,* two games out of three—scores for doing so 100 points.

There are five *honors* in bridge —ace, king, queen, jack, and ten of trump suit. In a 'no trump' declaration the four aces are the only honors, and are scored as follows: three aces held either conjointly or by one player count 30; four aces between partners score 40; four aces held in one hand score 100. When, on a trump declaration, a player has none of the trump suit, he has *chicane.* For a 'grand slam' by one side—making the whole thirteen tricks—40 points are placed to the honor score; for making a 'little slam,' or twelve tricks, 20 points. The honor score is not affected by doubling.

Suggestions for Play.—The declaring hand should hold not less than four reasonably certain tricks. The trump suit should be sufficiently strong either to capture the adverse trumps, or to clear them out and still hold a last one or two trumps in reserve. With fair trick-making possibilities in three or four suits, pass the call. With three aces and other probable tricks, declare 'no trumps,' and always with four aces. Do not double unless you are practically sure of making the overtrick, or your chances of doing so are promising, and the double is necessary to put you to game. Always consider the state of the score before declaring or doubling.

Auction Bridge, which has almost entirely superseded simple bridge, is a development of the game, which follows the rules of the latter in general, but differs most particularly in that the declaration of trumps goes to the player who bids the highest number of tricks for the privilege. The dealer makes the first bid, or passes, and each player bids (or passes) in turn until the highest bidder is ascertained.

If the declarer is successful in making his bid, he scores all the trick points (see table) he makes. If the declarer fulfils a doubled contract, he scores the doubled value of his odd tricks and for fulfilling his contract an additional 50 points in his honor score. If he makes more than his contract he scores an additional 50 points for each extra trick. If he is unsuccessful, his adversaries add 50 points to their honor score for each trick he falls short of his bid, regardless of the suit. For winning the rubber, 250 points are added to honors.

The Score in Auction Bridge

Odd Trick Values

In No-Trump	10 points
In Spade Trump	9 "
In Heart Trump	8 "
In Diamond Trump	7 "
In Club Trump	6 "

Honor Values

3 in one hand	0 in other	30 points
2 " " "	1 " "	30 "
3 " " "	1 " "	40 "
2 " " "	2 " "	40 "
3 " " "	2 " "	50 "
4 " " "	0 " "	80 "
4 " " "	1 " "	90 "
5 " " "	0 " "	100 "

The values of honors is not changed by doubling or redoubling. Grand slam counts 100, little slam 50 in the honor score.

A recent variation in the game of Auction Bridge which has claimed more or less attention is known as ***Contract Bridge.*** The main point of difference between Contract and Auction Bridge is that in the former the player scores below the line only such tricks as he contracts to take. Should any excess tricks be taken they are scored as a bonus in the honor score. Therefore if one is to make a game in Contract Bridge one must bid accordingly. In Europe, where Contract Bridge is known as *Plafond,* the trick scores are the same as in Auction Bridge, but in the American game as sponsored by New York experts the trick values are as follows: clubs 20; diamonds 20; hearts 30; spades 30; no trumps 35. Doubling doubles the trick value and the game is 100 points. The precedence of suits is no trumps, spades, hearts, diamonds, and clubs. The honor score is: four in one hand 100, five in one hand 150, 4 aces in one hand 150; each game won, 200; for winning a rubber, 300; for making a contract if doubled, 50 when not vulnerable, 100 when vulnerable (a side is *vulnerable* after winning a game); extra tricks, 50, if not doubled, 100 if doubled and not vulnerable, 200 if doubled and vulnerable; slams bid and made: little slam, 500 or 750, when not vulnerable, and vulnerable; grand slam, 1000 and 1500 when not vulnerable and vulnerable, respectively. Penalties for not making contract if undoubled, when not vulnerable, per trick 50, when vulnerable first trick 100, other tricks 200. If doubled, when not vulnerable 100 for each first four tricks, 200 for fifth trick, and 400 for each subsequent trick, all of which values are doubled if the side is vulnerable. The laws of Contract Bridge are the same as those of Auction Bridge, but it can readily be seen that the average rubber will run into much higher figures so that in the usual game the accustomed stakes are somewhat lower. Consult Irwin's *The Complete Auction Player* (1926); Lenz' *Contract Bridge* (1927).

Bridge, SIR FREDERICK (1844–1924), organist of Westminster Abbey (1875–1918), was born in Oldbury, Worcestershire. He studied music under Sir John Goss; was organist at Trinity Church, Windsor (1865–9); and at Manchester Cathedral (1869–75). He was subsequently professor of harmony at Owens College and Royal College of Music; Gresham professor of music; conductor of the Royal Choral Society (1896–1922); and King Edward professor of music in the University of London. His principal works are: *Counterpoint* (1877); *Musical Gestures* (1894); *Rudiments in Rhyme* (1896); *Mount Moriah* (1874); *Boadicea* (1882); *Rock of Ages* (1886); *The Inchcape Rock* (1891); *Twelve Good Musicians* (1920); and *A Westminster Pilgrim* (1919), an autobiography. He was knighted in 1897.

Bridgehead. See TÊTE DE PONT.

Bridgend, brij'end', market town, Wales, in Glamorganshire, on the Ogwr River; 20 miles west of Cardiff. It has stone quarries, iron works, and coal mines. In the vicinity stand the ruins of several ancient castles. Pop. (1921) 9,206.

Bridgenorth. See BRIDGNORTH.

Bridge of Sighs (Italian *Ponte dei Sospiri*), a covered stone bridge in Venice (q.v.), crossing the Rio della Paglia and connecting the Doge's Palace with the criminal prisons. It is celebrated in the opening lines of the fourth canto of Byron's *Childe Harold:* 'I stood in Venice—on the Bridge of Sighs.' The name is also given to a bridge in New York City, joining the Criminal Courts Building and the Tombs Prison.

Thomas Hood's poem *The Bridge of Sighs* refers to neither of these bridges, but was inspired by the drowning of a London outcast in the Thames.

Bridge'port, city, Alabama, in Jackson County, on the Tennessee River and the Nashville, Chattanooga, and St. Louis Railroad; 120 miles northeast of Birmingham. Pop. (1910) 2,125; (1920) 2,018.

Bridgeport, city, Connecticut, one of the county seats of Fairfield County, on Long Island Sound, and on the New York, New Haven, and Hartford Railroad; 18 miles southwest of New Haven, and 56 miles northeast of New York, with which it has steamship connection. The estuary of the Pequonnock River, which empties into the Sound at this point, and Yellow Mill Creek, a tidal inlet, furnish excellent harbor facilities. On a peninsula between the two is East Bridgeport, the manufacturing centre of the city. The business and residential districts lie opposite, on the west shore, and three miles down the Sound is the suburb of Black Rock, a popular resort for yachtsmen. A number of parks furnish recreational facilities, notably Seaside Park at the southwestern end of the city, which has a fine beach and contains a Soldiers' and Sailors' monument and monuments to Elias Howe and P. T. Barnum. Beardsley Park at the northern extremity of the city, is also noteworthy.

The principal public buildings are the Federal Building, Fairfield County Court House, Barnum Memorial Institute, Y. M. C. A. Building, and Burroughs Free Public Library. Hospitals and philanthropic institutions include the Bridgeport, St. Vincent's, and Emergency Hospitals, Sterling Widows' Home, Burroughs Home for Aged Women, and the Protestant Orphan Asylum.

Bridgeport is an important manufacturing centre. According to the U. S. Census of Manufactures for 1927, industrial establishments numbered 331, with 28,415 wage earners, and products valued at $158,697,415. Important products are corsets, sewing machines, typewriters, brass, iron, and steel tubing, graphophones, locomobiles, arms and munitions, torpedo boats, tools, machinery, and hardware. Among large manufacturing concerns are the Wheeler & Wilson Sewing Machine Company, the Union Metallic Cartridge Company, the American Tube and Stamping Company, Warner Brothers Corset Company, American Graphophone Company, the General Electric Company, the Crane Company, and the Remington Arms Company. The city also has shipyards and a thriving oyster industry.

The first settlement was made in 1639. The town was known as Pequonnock from 1665 to 1694, then as Fairfield village until 1701, when it was renamed Stratfield. The borough of Bridgeport was incorporated in 1800, the township in 1821, and the city in 1836. As a centre for the manufacture of war munitions, Bridgeport experienced a period of unprecedented growth during the European War. Pop. (1910) 102,054; (1920) 143,555.

Bridgeport, city, Illinois, in Lawrence County, on the Baltimore and Ohio Railroad; 135 miles east of St. Louis. Pop. (1910) 2,703; (1920) 2,229.

Bridgeport, village, Ohio, in Belmont County, on the Ohio River, and the Baltimore and Ohio and the Pennsylvania Railroads; opposite Wheeling, W.Va., with which it is connected by bridges. It has manufactures of steel rails and structural shapes. Many coal mines are operated in the vicinity. Pop. (1910) 3,974; (1920) 3,977.

Bridgeport, borough, Pennsylvania, in Montgomery County, on the Schuylkill River, and the Philadelphia and Reading and Philadelphia and Western (electric) Railways; opposite Norristown, and 15 miles northwest of Philadelphia. It has paper, fibre, woollen, cotton, flour, knitting, and tubing mills, as well as structural iron works. Pop. (1910) 3,860; (1920) 4,680.

Bridger's Pass, a defile of the Rocky Mountains, in Southwestern Wyoming. It extends for a distance of several miles, and its precipices of red granite and metamorphic sandstone rise almost perpendicularly to a height of 1,000 to 2,500 feet. Before the opening of the Union Pacific Railroad the emigrant and mail route led through this pass.

Bridges are the chief of the three available means of crossing rivers: ford, ferry, and bridge. Our intensive transportation and commerce could not exist without the facilities provided by the highly developed art of bridge construction. Many different types of bridges are used, according to the conditions to be met at the crossing. The chief ones are represented in the adjoining list, which gives the most prominent bridges of their respective types, measuring magnitude by length of span, or in some instances by height.

The log and vine used by our

The Largest Spans of Various Types

	Span, Feet.	Rise, Feet.
Stone Arches:		
Plauen, Germany, 1903	295.3	59.5
Concrete Arches:		
Rome	328	32.8
Brest, France (under construction	590	110
Steel Arches:		
Hell Gate, N. Y., 4-track railroad bridge,	1,000	220
Kill van Kull Bridge (under construction)	1,675	274
Sydney Harbor Bridge, Australia (under construction)	1,650	350
Simple Truss Bridges (steel):		
Metropolis	720	....
Continuous Bridges (steel):		
Sciotoville, Ohio	2 at 775	....
Cantilever Bridges:		
Quebec	1,800	....
Suspension Bridges:		
Williamsburg, N. Y	1,600	....
Brooklyn, N. Y.	1,595.5	....
Ambassador Bridge, Detroit, Mich	1,850	....
Fort Lee Bridge, N. Y. (under construction)	3,500	....
High Viaducts:		
Loa	336[1]	800[2]
Lethbridge	314[1]	5,327[2]

[1] Height, feet. [2] Length, feet.

aboriginal ancestors were early superseded by man-made *beam* and (probably in China) *suspension* bridges. *Arches*, invented by the Etruscans, were perfected and applied by the Romans on a large scale to bridging; the elevated portions of their great aqueducts are monuments to their skill as arch builders (see ARCH). Beyond this stage, however, bridge construction ceased to develop until within the last 150 years, and thus it may be said to have remained primitive until the modern era. The marked progress since then is due partly to the progress of industry, furnishing better and cheaper materials, and partly to advance in science and technology. The growth of the railway after 1820, calling for many and strong bridges, also acted as a powerful stimulus.

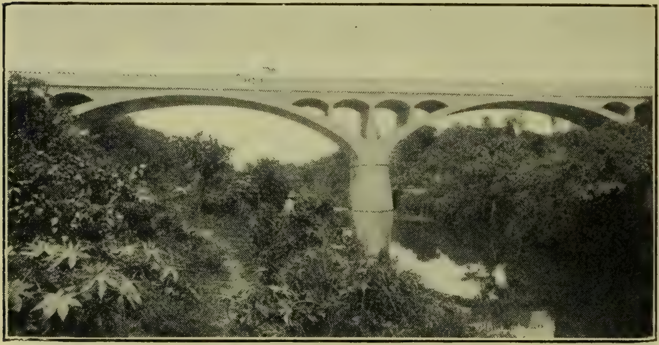


FIG. 1.—*Vaughn Bridge, on Manila South Road, P. I.*

Concrete arch bridges, now built in large numbers, are well suited for remote locations. Three-fourths of the material (sand and stone) is obtained locally, and low-grade labor can be used.

The roadway platform or *floor* of the modern bridge is not essentially different from that employed by the ancients, though transformed and improved as to materials, strength, permanence, etc. The characteristic developments have been in the carrying structure, and bridges are classified according to the nature of this structure. A number of the types, however, are identical with those of primitive times: the *beam* bridge, the *arch* bridge, the *suspension* bridge, the *pontoon* bridge, and the *bascule*—the last named perhaps the leading form of the modern *movable* bridge. The most important of all present-day types, however, the *truss* bridge, is wholly new, and its development has extensively influenced that of the other types. The truss was first applied to replace the beam, and this is still its most important service. It has also found a large use in arch service, and as a necessary part of suspension bridges for modern traffic. It is a meshwork of relatively slender bars, usually (considering now only the plane truss) arranged as a chain of triangles. This broad definition of the term is sometimes implied in what follows, though sometimes the narrower meaning of *simple truss*, or truss performing functions analogous to those of the beam on two supports, is to be understood.

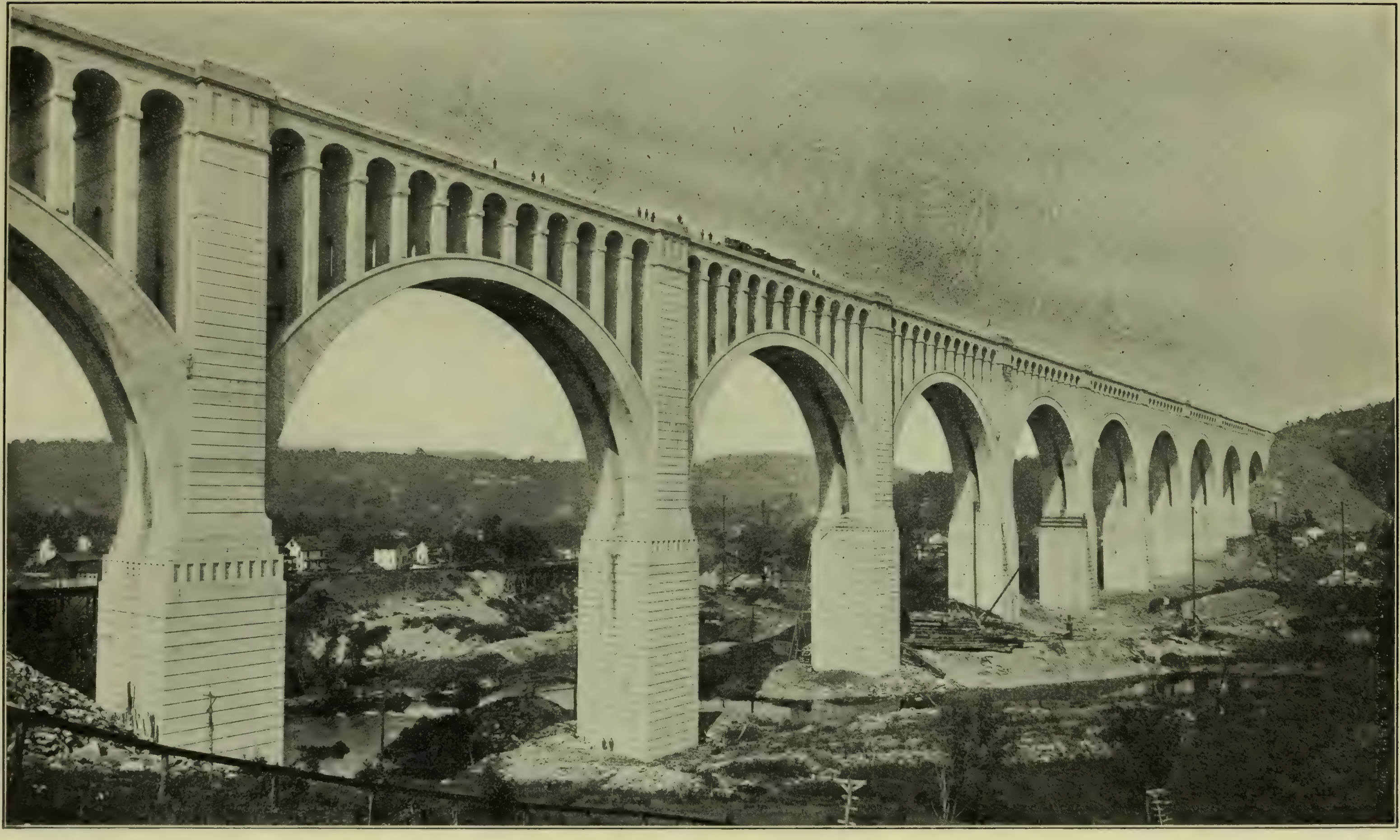
Bridge construction has at all times been determined by the materials available. The ancients built bridges of wood, stone, and brick. Iron was costly, and could be made and shaped only in small pieces. A small brook could be spanned by a beam bridge, consisting of timbers laid across from bank to bank and covered by a plank roadway. Wider streams were crossed by beam bridges of many spans, the intermediate supports being clusters of piles (as in the bridges made memorable by Cæsar) or stone-filled wooden cribs or masonry piers, spaced as close together as the available lengths of beam required. Permanent bridges were formed by a series of arches, which probably seldom exceeded 30 to 50 foot span; these had to have masonry piers as supports. The difficulty of constructing piers and their foundations in rivers, especially in soft bottom, greatly limited the application of this type. Large and deep rivers were often crossed by bridges of boats, or pontoon bridges (Darius, Xerxes), consisting of a number of boats fastened together to form a string from bank to bank, and beams with floor planking laid over the boats to form a roadway.

The mediæval bridges included as a new type the *drawbridge*, used to permit or bar access to fortified places and castles surrounded by a moat. It was simply a wooden beam bridge trunnioned at one end, while at the other end were attached chains leading up and back to pulleys supported at a considerable height above the trunnions, and thence leading down to counterweights. By pulling down the counterweights the bridge could be raised from horizontal to vertical (open) position. Beyond a few small chain suspension bridges, the fixed bridges of that period were limited to the ancient types just mentioned, but increased constructive skill was shown by greater lengths of span, arches often reaching spans of 80 to 100 feet.

Development began late in the eighteenth century with the construction of compound wooden beams (toothed beams) to make large bridge timbers out of small ones, and the devising of primitive wooden trusses in Switzerland and Germany (though Italian engineers, like Leonardo da Vinci, had made sketches of true trusses more than a century earlier). Then,the iron industry having progressed considerably, cast iron was utilized as material for arch bridges in a few instances, first in England (at Coalbrookdale), and soon afterward in Germany. Beginning shortly before 1800, numerous forms of truss (Town, Long, Burr) were invented in the United States—some intended to be built wholly of timber (web members in close lattice arrangement, nailed or tree-nailed to the chords), and others with iron tension rods and wooden struts.

By that time the evolution of wrought-iron production and rolling began to make plates and shapes of iron available, and in the third decade of the nineteenth century some small beam bridges of wrought iron were constructed for railway use. Wood still remained the principal material for beams and trusses, while stone arches remained the standard for strong and permanent bridges. But *combination truss bridges*, with timber struts and iron tension rods, developed in the thirties and forties; and in the latter part of that period iron rolled beams and plate girders came into some use for short spans, and truss bridges with cast iron struts and wrought-iron tie-rods for longer spans. Robert Stephenson's tubular wrought-iron plate-girder spans of the Menai Straits bridge in England (1847), a remarkable work of engineering, represented one of the stages in the development of the plate girder, shortly before the construction of wrought-iron trusses. A few suspension bridges also found use in that period and earlier (by Finley in America, Telford and others in England), with chains as suspension members, for long spans; later, wire rope was used.

About 1850 the first trusses



TUNKHANNOCK CREEK BRIDGE OF THE D. L. AND W. RAILROAD, FIFTEEN MILES WEST OF SCRANTON, PA.

It is built of concrete. 2,230 feet long, and 240 feet high above creek bed. It comprises twelve semicircular arches, ten of which span 180 feet, and two 100 feet. The whole bridge contains nearly 175,000 cubic yards of concrete, and over 1,100 tons of reinforced steel.

built wholly of wrought iron appeared, and from that time onward there has been steady progress in wrought-iron bridge construction, as to both trusses and plate girders. Tubular plate girders quickly became obsolete. Suspension bridges saw great development for very long spans, reaching their climax for boldness in the erection of the Brooklyn Bridge at New York in the seventies and early eighties. Wrought iron was displaced by the very similar but stronger material *soft steel* about 1890. Higher-strength steel, as nickel steel and silicon steel, has been used for some very large bridges since 1903. Wood continues in use for small beam bridges of low cost, and in very minor degree for truss bridges; while one or two truss bridges of reinforced concrete have also been built, and concrete beam or girder construction has seen considerable development for short spans.

Stone arches continued in extensive favor long after the popularization of Portland cement, invented early in the nineteenth century. About 1890, however, cement concrete began to be used for arches, and soon afterward the development of reinforced concrete (concrete with embedded steel rods to give tensile strength in the required directions) led to the present-day extensive use of this material in beam and arch construction.

The great strength of wrought iron and steel, the facility of producing them in forms and sizes suited to bridge work, their lightness when used in beams and struts as compared with stone and timber, the easy and perfect connection of iron parts by bolts and rivets (chiefly the latter), and the absence of decay and fire danger, were vital factors in the rise of iron bridges. Advances in foundation construction were also important. The rapid spread of concrete construction, in spite of the fact that this material is very heavy, is due to the permanence of concrete, its ease of shaping, and the cheapening of high-grade cement.

Strength of Bridge Materials.— The strength characteristics of bridge materials may be summarized as follows: *Wood* breaks in compression at 3,000 to 6,000 lbs. per square inch pressure in the direction of the grain, and at about 10,000 lbs. per square inch tension. Its cross-grain strength is hardly one-tenth as great. Its tendency to split and shear along the grain, and the difficulty of attaching a wooden tension member to other parts, limit its application largely to struts and beams. Stresses of 800 to 1,600 lbs. per square inch along the grain are safe. *Cast iron* is very strong in compression—about 100,000 lbs. per square inch; but in tension it is only about twice as strong as wood, while it is brittle and liable to cracks and internal defects. It is excluded from bridge service nowadays except for such parts as bearing blocks. *Wrought iron* and *soft steel* are of high strength in both tension and compression (50,000 to 70,000 lbs. per square inch), and are also malleable and tough,so that holes can be punched and pieces bent; stresses of 15,000 to 20,000 lbs. per square inch are safe. *Nickel steel* and other high-strength steels may be stressed to 20,000 to 30,000 lbs. per square inch, as in the St. Louis Arch Bridge, which was the first steel bridge built anywhere (1875). *Stone* and *concrete* (artificial stone) are weak in tension, but in concrete this deficiency can be compensated for by steel reinforcement moulded in. Stone in bridge construction is limited to compressive service, for which it may be stressed to from 200 to 800 lbs. per square inch (15 to 55 tons per square foot). Concrete is rarely loaded higher than 650 lbs. per square inch in compression; in reinforced concrete the steel, if suitably arranged, may be stressed to 12,000 to 24,000 lbs. per square inch tension.

Recent Notable Bridges. — Views of typical recent bridges are shown in the accompanying illustrations. Concrete arches are widely used for city bridges and on important country roads, but frequently also for railways. The famous *Tunkhannock Viaduct* of the Delaware, Lackawanna, and Western Railroad in Northeastern Pennsylvania is perhaps the largest in the world as to volume of concrete. The longest span of modern Truss Bridges is at present the *Metropolis* 720-foot span (Fig. 2), which in comparison with plate-girder spans as shown in Fig. 3 is equal to nine or ten such spans. How a large truss bridge is erected may be seen from the illustration of the *St. Louis Municipal Bridge* across the Mississippi, Fig. 5. (Note the temporary *falsework*, and the erecting crane.) Cantilever Bridges are erected without falsework, by overhanging from the piers, pieces being added successively at the forward end to closure at the middle (see illustration of *Quebec Bridge* over the St. Lawrence River).

Steel arch bridges of long span over wide and deep spaces present the boldest examples of modern steel bridge construction because of the balancing and fitting of great masses of steel in erection without falseworks before the arches are closed and self-supporting. The first structure erected in this way was the steel arch bridge over the Mississippi River at St. Louis in 1874. The *Zambesi Bridge* in Africa (500 ft., see Fig. 9) and the two Niagara arches, the upper (840 ft. span) for roadway and the lower (550 ft. span) for double-track railroad, are most remarkable for their locations over very deep canyons. The Hell Gate arch of 1,000 ft., over the East River at New York City, has the distinction, besides being a part of the longest railroad bridge (including approaches, 17,260 ft. long,—see full page illustration—consisting of a series of concrete arches, riveted deck trusses, and plate girders, bascule spans, and 4 spans of the heaviest pin-connected trusses of parabolic form), of being designed for the heaviest live load of any bridge—it represents 4 trains of locomotives on 4 railroad tracks, laid in stone ballast throughout, with capacity and room for a 5-lane speedway boulevard on a second deck when desired for roadway traffic. A tremendous outward thrust is exerted by the steel arch against the piers or abutments, just as by stone or concrete arch, as may be appreciated from the position of the parts in this view. There are now under construction two great steel arch bridges of still longer span but for only half the live load of the Hell Gate Bridge: one is the bridge for roadway and rapid transit over the Kill van Kull in New York City (1,675 ft. span) and the other for roadway, 2 street tracks, and 2 railroad tracks, the Sydney Harbor Bridge in Australia, (1,650 ft. span). The completion of each is expected in 1932.

In the Suspension Bridge, the pull of the cables produces an action on the anchorage the opposite of the thrust of the arch, which is provided for in some cases by tying the cables back to the rock, and in some by the stability of a huge masonry anchorage block (*Brooklyn Bridge* and *Williamsburg Bridge* in New York City). Because steel wire can be made enormously strong (over 200,000 lbs. per square inch tensile strength), very long suspension spans are possible.

A suspension bridge of 3,500 feet span is now under construction over the Hudson River at 178th Street, New York City. This is intended for roadway and, ultimately, for rapid transit traffic. Another span of the same length is planned at 57th Street for railroad, passenger, and freight traffic on lower deck and roadway traffic on upper deck. Two other notable suspension bridges for roadway traffic have been built, one from Philadelphia, Pa., to Camden, N. J. (1,750 feet), and the other over the Detroit River at Detroit, Mich.

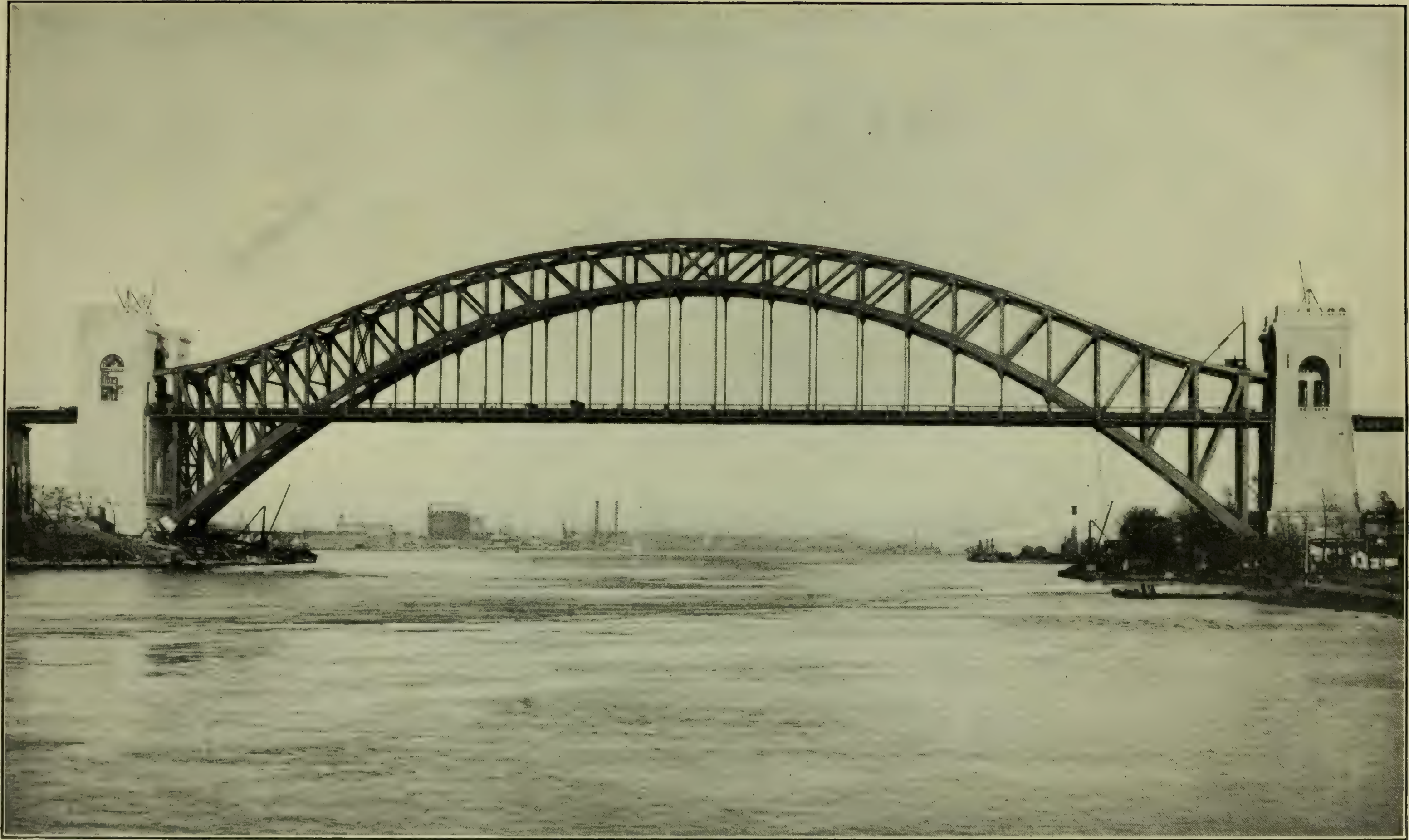


Photo by B. Hellmich, N. Y.

HELL GATE ARCH, CROSSING THE EAST RIVER AT NEW YORK. A FOUR-TRACK RAILWAY BRIDGE SPANNING NEARLY 1,000 FEET

The span between centres of skewbacks is 977½ feet; the distance between pier faces is over 1,000 feet. The deck is about 150 feet above river level. The arch intrados rises 260 feet above water, or 220 feet above skewbacks. The steel of the arch weighs 19,000 tons, and with the concrete floor, ballast, and track, nearly 27,000 tons. The towers are 103 feet wide, as seen in the picture, and 240 feet high.

(1,850 feet). Where a very wide river is so deep or has unfavorable bottom for erecting falsework, the suspension bridge type is the most suitable and economical for a bridge of long span.

A fundamental difference in bridge types arises from the fact that beam and truss bridges bear on their supports with direct vertical pressure only, while suspension and arch types exert large sidewise forces. Because vertical loads are most easily provided for, the beam and truss types are by far most frequently used except for very long spans. Ordinarily, the *reactions* or pressures at the supports are easily found, for any particular distribution of loads on the structure, by the principles of lever action, without regard to the internal construction of the bridge. But in certain types the internal structure modifies the amounts of the several reactions; for example, in a beam which extends without break or joint over three or more supports, and in arches (except the three-hinged type). The analysis and safe design of such bridges call for special and rather intricate methods of calculation. Every part of a bridge must be made of sufficient strength for the *stresses* which may be produced in it by any loads that can come on the bridge, in any possible positions of those loads. So also must the connections by which this part is attached to other members of the bridge be proportioned to their maximum service. The construction of any bridge must therefore be preceded by complete design of the structure in all its details, and the first step in the designing, after the bridge engineer has selected or laid out the general type and arrangement of parts, and determined what loads it will have to carry, is the calculation of the stresses. The general principles and elements of the methods are outlined here as a means of explaining the peculiarities of the various types of bridges.

Mechanics of the Beam Bridge.—The beam or girder is exemplified by a stick laid across the opening between two chairs, or by the floor joist of a house or of a bridge. The beam deflects under a load, so that its straight shape becomes slightly curved. In this process the upper portions of the beam are shortened or *compressed* longitudinally, while its lower parts are lengthened or *extended.* The resistance of the material to this shortening and stretching, or the *bending resistance* of the beam, opposes and limits the deflection, and thereby holds up the load. Those parts of the beam nearest the upper surface experience the greatest compression, and those nearest the lower surface the greatest extension; while intermediate parts are strained less, in proportion to their distance from an intermediate position called the neutral axis, which in a wooden or steel beam of symmetrical section lies at mid-height. Integrating this action (expressed as a turning moment about the neutral axis of the cross section of the beam), it is calculated that the strength of a rectangular beam to resist bending is measured by one-sixth the product of breadth by square of depth, or $\frac{1}{6}\,bd^2$, multiplied by the greatest tensile or compressive stress (in pounds per square inch) which the material will safely bear.

The bending effect of the load, the *bending moment,* increases with the span length, and is greatest at or near mid-span. If a beam is L feet long, and carries 1,000 lbs. uniformly distributed along its length, the greatest bending moment is $\frac{1}{8}$ 1,000 L; if the 1,000-lb. load is concentrated at the centre, the greatest moment is $\frac{1}{4}$ 1000 L. For wood, if the allowable compressive or tensile stress is 1,200 lbs. per square inch, the proportions of the beam must be such that the bending resistance equals or exceeds the bending moment, or $\frac{1}{6}\,bd^2$ times 1,200 inch-pounds = $\frac{1}{8}$ 1,000 L foot-pounds times 12. Suppose this beam must span 20 feet ($L = 20$ ft.); then bd^2 must be at least equal to 150. This would require a beam 1½ inches wide by 10 inches deep, or one 3 inches wide by 7 inches deep.

The use of beams to form a single-span bridge over a brook is obvious: stone supports (abutments) built on the banks, a num-

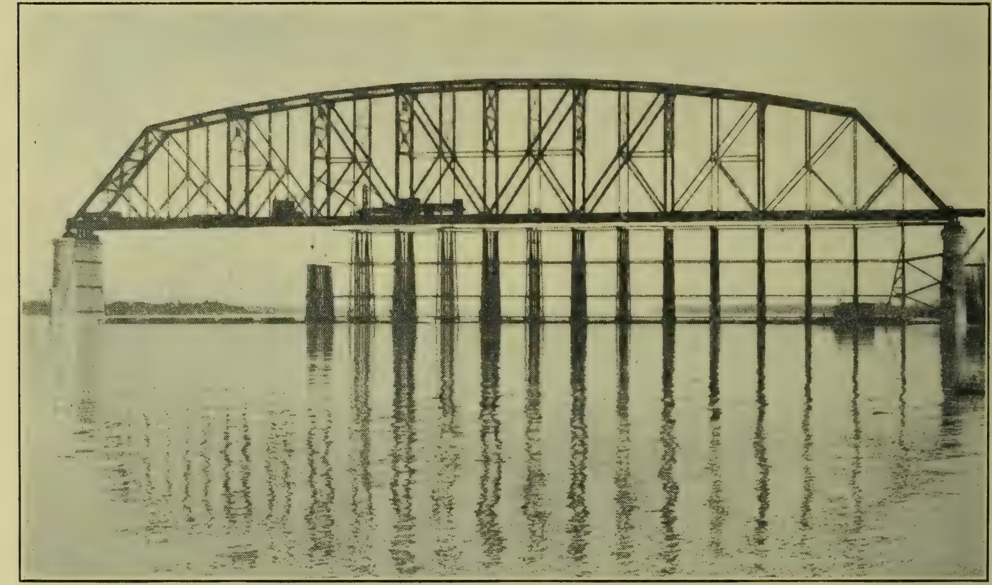


FIG. 2.—*Metropolis 720-Foot Span, the Longest Simple Truss Ever Built*

A railway crossing over the Ohio River near Paducah, Ky. It has also four spans of 550 feet. The span was built on timber falsework, one 'bent' at each panel point, just being removed when the picture was taken. This bridge is of high-strength steel: the tension members of nickel steel and the compression members of silicon steel. (See drawing, page 294.)

ber of beams laid across, and a floor of planks laid crosswise over the beams, are the essential elements. While there are many beam bridges of this kind, an equally important use is made of similar assemblages to form the floor of a truss bridge spanning a much longer distance. Large transverse beams (*floor beams*) carried by the trusses at intervals of 15 to 50 feet along the span form the supports for longitudinal beams (*stringers*), which as in the simple beam bridge carry the flooring.

Other stresses than the flexural tension and compression exist in a beam bridge. Short, heavily loaded beams require analysis for shearing stress (transverse and longitudinal). Side-grain pressure at the ends of a wooden beam where it is supported must be limited to about 200 lbs. per square inch to avoid crushing. The several beams may require to be braced and stayed laterally unless the flooring (solid planking or concrete) performs this service.

Action of the Plate Girder.—A remarkable invention, the I-beam (*A*, Fig. 4), first produced in the iron-rolling mill less than a century ago, realized the possibilities of wrought iron for beam service almost ideally. Today I-beams, as well as all other brdge material, are made of steel. In the I-beam the metal is concentrated in top and bottom *flanges*, where it is most effective to oppose bending by its tensile and compressive strength; only a thin *web* connects the flanges, and by its internal shears, horizontal and vertical, applies the longitudinal stresses to the flanges. Without the web the flanges would have very small strength in bending. Such I-beams, rolled in depths up to 30 inches (most commonly 8 to 24 inches), are used for short bridge spans. The bending strength of an I-beam is measured by its *section modulus*, given in civil engineers' handbooks, which corresponds to the quantity $\frac{1}{6}$ bd^2 of the rectangular beam. But steel may be stressed safely to 15,000 or 18,000 lbs. per square inch against less than one-tenth as much for wood. On this account a 24-inch I-beam weighing 80 lbs. per lineal foot is as strong (in bending) as an oak beam 18 inches wide and 24 deep, weighing 150 lbs. per foot.

The plate girder extends the I-beam principle to much larger dimensions. A common form is shown by its cross section in Fig.4 *B*. The web is a plate, the flanges are angle-shaped bars (*angles*), often supplemented by *cover plates*, all held together by rivets. Plate girders 48 to 60 inches deep and 30 to 60 feet long are common in bridge construction, but many have been built of a depth of 120 inches and in length from 100 to 130 feet—three such girders supporting a double-track railway line for the heaviest modern train loading. By the box-girder construction (Fig. 4, *C*) still greater strength can be obtained, but for practical reasons this form is less often applied in bridges than in steel frames of buildings. The bending resistance of the plate girder is most readily conceived of as represented by the total compressive or tensile strength of one flange (cross-sectional area of one flange multiplied by the safe strength of the steel per square inch) multiplied by the depth between centres of flanges; this *resisting moment* must be equal to the bending moment of the loads and reactions on the girder. The shearing stresses in the web also need consideration, especially to insure sufficient strength of the riveting between web and flange.

A plate-girder bridge in its simplest arrangement is the *deck bridge* (with roadway above), as shown diagrammatically by sketch *D* in Fig. 4. For a single-track railway bridge only two girders would be used, braced together by *lateral bracing* in the planes of upper and lower flanges to resist lateral bending from wind pressure and the like, and by *sway bracing* in the transverse vertical planes (to hold the girders from tipping); the track ties usually rest directly on the girders. If the floor is in the plane of the lower flanges the girders must be farther apart, steel beams must be riveted from girder to girder to support longitudinal stringers to carry the ties, and the structure is thus more costly. Top lateral bracing cannot be used, as it would block the passage of vehicles on the roadway; the upper flange of each girder may be stayed against lateral buckling by sloping braces attached at the lower end to the beams of the floor.

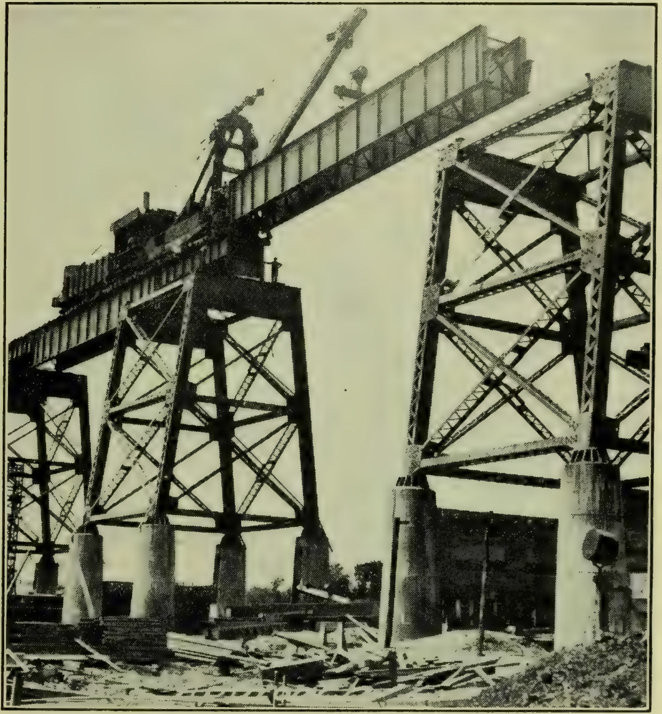


FIG. 3.—*Railway Plate-Girder Viaduct Under Erection*

The plate-girder span, comprising two girders and their lateral and sway bracing, being set in place as one piece by the derrick car standing on the completed viaduct.

The Truss.—A number of separate slender sticks pinned together at their ends to form a meshwork of triangles, as in *E* and *F*, Fig. 4, constitute a rigid assemblage resisting distortion (provided it is so stayed that it cannot be forced out of its plane). Such a meshwork is called an *articulated frame*, or more simply a *truss*. It has the property of the beam — namely, resistance to bending—though the individual sticks (*truss members*) may be quite slender and possess very little individual bending strength. Comparing the trusses Figs. *E* and *F* with a plate girder, the members forming upper and lower boundaries of the truss (*chords*) are equivalent to the flanges of the plate girder, while the intermediate *web members* take the place of the web plate. A small truss is therefore often called a *lattice girder*. The *lattice truss* (*G*), invented by Town in the United States in 1804, was one of the earliest truss forms invented. In modern truss analysis the Town truss is classed as one having *multiple web system* or a *multiple-intersection truss*, because when compared with the most simple truss (*E*) it appears as though made of several such trusses overlapped, the chords coalescing. Multiple-intersection trusses are practically obsolete.

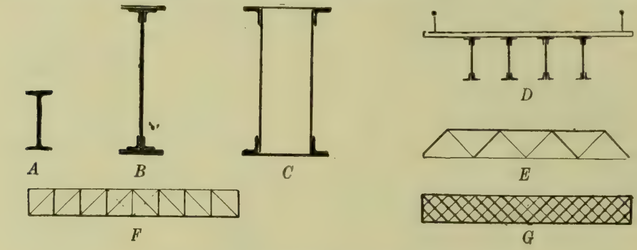


Fig. 4.—*Girders and Trusses for Bridges*

(For description of diagrams see text.)

Truss Analysis.—The typical truss bridge consists of two trusses, spaced 15 to 30 and more feet apart, and braces connecting them so as to hold them upright. The beams of the floor are attached to the truss at angle points of the truss meshwork; thus the trusses are loaded at these points only. In studying the action of the loads, it is enough to consider one of the trusses. The loads exert forces on all the individual truss members; these forces are readily determined by the rules of simple statics. We can see that removing any one member would cause the truss to collapse, since a deformable quadrilateral would result from the two adjoining triangles; therefore each member is subjected to a force, and as the force is transmitted to adjacent members at its ends, the two ends of the member must exert equal and opposite forces, directed along the axis of the member. Thus, the stress in the member is either direct compression or direct tension. Such of the truss members as experience tension may be made of ropes or of slender iron tension rods; the others must be stiff, to avoid buckling, but do not need to be proportioned to have a large lateral bending strength. Each member has its full cross section acting at full efficiency in resisting stress, because it is stressed axially, while in a beam only the outer portions get highest stress and the interior is not fully utilized. Herein lies the economy or weight-efficiency of the truss.

The truss *E*, Fig. 4, resting on supports at its ends and carrying loads at its intermediate angle points (*panel points*), can be analyzed completely by the simple principle of the *triangle of forces* (see Mechanics). To begin with, the reaction of the left-hand support can be resolved into two components, acting along the lines of the two end members; these component forces are the stresses in these two members. The stress in the inclined *end post* must be balanced at its upper end or *hip joint* by the stresses in the other two members meeting at that joint, which again allows of drawing a triangle of forces to determine the amounts of these two stresses. The same procedure may be carried through the whole truss, and thereby all the stresses determined. It then remains only to proportion each member to suit the stress it carries.

In the process just described, the force triangles need not be drawn separately, but may be joined (saving one-half the number of lines), and thus they form a Cremona or Maxwell diagram, sometimes called simply a *stress diagram*. This figure has peculiar properties; it has a vertex point corresponding to each open area or mesh of the truss, and a mesh corresponding to each vertex of the truss, and for this reason is called a *reciprocal figure*. By Bow's notation, placing letters or numbers one in each mesh of the truss, these letters or numbers will then designate the vertices of the stress diagram, and each will occur only once, if the diagram is drawn correctly.

Arithmetical calculation is often most convenient for truss analysis. The lever principle in elementary form suffices for this purpose, if skilfully applied. Cut the truss *E* in two by a vertical cut, which will sever three members, and discard one of the two pieces, retaining and studying, say, the left-hand part. Since this part now lacks the forces that were exerted upon it by the stresses in the three cut members, it will fall down, due to the loads on it; but if we supply three forces exactly equal to these three stresses, the part will stay in place, since it is in just the same condition as to forces as before the truss was cut apart. Now take as imaginary fulcrum the point where the cut web member and the cut lower chord (prolonged) meet. The leverage of the left-hand truss reaction and of all the loads on the part about this fulcrum can now be computed, and, as will be recognized, the opposing leverage of the top-chord member—*i.e.*, of the force applied to this member—must be equal and opposite to the other leverage, in order to account for the existing perfect balance and immobility of the part of the truss. This calculation obviously gives the amount of the unknown top-chord stress by direct arithmetical division. The same method, only taking the intersection of web member with top chord as fulcrum (*centre of moments*), gives the bottom-chord stress. As to the stress in the web member, the fact is utilized that the vertical components of all forces acting on the part must balance; or, since in this case the reaction and the loads are all vertical, the difference between (upward) reaction and (downward) loads on the part will be equal to the vertical component of the stress in the web member. This difference, the *shear* in the truss at the point where it was cut apart, is to be multiplied by the secant of the angle between web member and a vertical line to give the stress sought (since the shear is the projection of the web stress on the vertical).

This method applied throughout the truss suffices to give all the stresses in the members under the particular amount and distribution of loads then considered. It may be applied in the same way to any type of *simple truss*, which has no supernumerary members and permits of cutting the truss by a series of sections which cut each only three members, so that the procedure above outlined is feasible. In many commonly used forms of truss, however, certain sections will cut four members without vitiating the above method. It is possible in such cases to determine the stress in one of the four members by the calculation of local equilibrium at a panel point where two of three meeting members are in a straight line, or by other auxiliary relations. When a truss departs sufficiently from the simplicity of internal structure of the truss in *E*—*i.e.*, when it contains more members than will just suffice to preserve its shape—it is said to have *redundant members,* and is *statically indeterminate.* Such a truss must be analyzed by more abstruse methods, noted further on.

While the truss shown has *parallel chords,* the common design for large truss spans is like that of Fig. 2 and Fig. 5, with *inclined* or so-called *curved chords.* The methods of analysis for these depart a little in detail from the above outline, but are in essence the same. Before proceeding further, with the calculation of stresses, however, the character of loading must be noticed. A bridge is affected by:

Dead Load and Live Load.—The weight of the bridge itself and of any fixed attachments is called the *dead load.* This being immovable, only one kind and amount of stress exists in a particular member due to it. But the loads imposed by traffic, the *live load,* cause different stresses depending on their position on the bridge. Thus, in the truss *F*, Fig. 4, the diagonals are stressed in tension by the dead load; when a heavy wagon or a steam roller enters on the bridge at the end farthest from the diagonal, it increases the tensile stress until the time when it passes the diagonal, when in a few seconds its effect changes and it throws a high compressive stress on the diagonal, or rather suddenly decreases the dead-load tension. In certain diagonals this live-load compression may exceed the dead-load tension, causing *stress reversal.* Because of this effect such trusses as the sketch shows are fitted with a second diagonal in each of the panels near mid-span, this second being inclined in the direction opposite to the first one, hence called a *counter.*

Since the live load increases and decreases the prior stresses according to its position, its greatest effect in both directions must be examined if the bridge is to be safe. For the web members in particular the greatest effects occur under partial loading. Therefore the positions of loading which produce the greatest stress in a particular member of the truss must first be found. This operation involves an important branch of the science of truss analysis. In general, the greatest chord stresses are produced by a load covering the whole bridge, while the greatest web stresses are produced by loads covering all of the bridge to one side of the particular web member under consideration. This statement, however, is far from adequate in case of loading like that produced by a railway train, comprising a sequence of concentrations at fixed spacing apart. Various intricate methods, both analytical and graphical, have been devised to deal with this problem. Further, the statement applies only to simple spans—*i. e.,* those similar to a beam resting on two supports. In the case of arch, cantilever, and continuous bridges, a special analysis must be made to find the maximum positions of loading.

A widely used modern device for this purpose, useful alike for continuous load and for wheel loads (train loading), and for all types of bridge, is the *influence line.* An influence line for a given member of the truss is a diagram whose base is the entire span of the bridge, and whose ordinate at each point represents the stress in the member when a load of one pound is placed at that point. Thus, the influence line for the web member of a simple truss has part of its length above the base (representing tension) and sloping up from the end of the span, and part below the base (compression) sloping downward from the other end of the span, and a sharply sloping line within the panel of that web member connecting the two lines. Such a line shows at a glance that the greatest possible tension in the member occurs when that part of the span is loaded that lies under the upper portion of the influence line. In bridges of complex make-up it is often convenient to draw the influence line of each member by computing the stress produced in it by a 1-lb. load placed successively at the first panel point, the second, and so on. Then the load positions for maximum stress

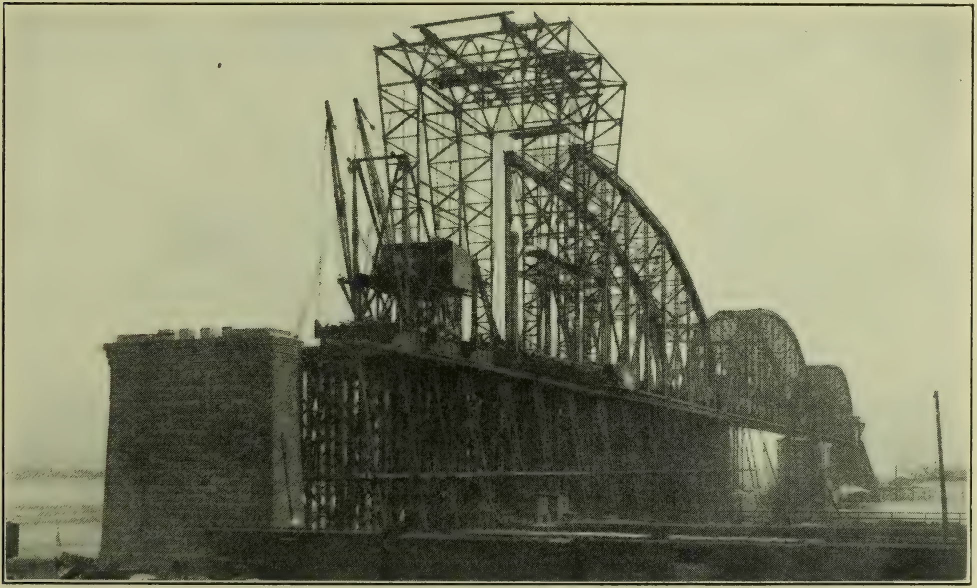


FIG. 5.—*Erecting a Large Truss Bridge on Falsework by Travelling Derrick and Gantry Cranes*

A 668-foot span of the St. Louis Municipal Bridge, Mississippi River. The derrick traveller in the foreground is setting the plate-girder floor beams and stringers. The gantry back of it is engaged in truss erection. The hoisting tackle hung from the upper part of the gantry must handle very heavy loads, as the single members weigh 20 to 30 tons each.

are perceived at once, or (for wheel loads) can be found by a few simple trials; and then the stress may be obtained from the influence line by scaling off the ordinates of the influence line under each load, multiplying by the amount of that load, and adding these quantities.

Wind and Centrifugal Stresses. —The transverse bracing which connects and holds upright the two (or more) trusses of a bridge must be strong enough to resist the side pressure of wind, forces due to centrifugal action of trains (if the track is on a curve), and lateral shock and vibration tendencies. The amounts of these forces being known or estimated, the lateral bracing is arranged and proportioned to resist them, by methods quite similar to those used in analyzing the trusses themselves. There is usually a set of braces in the plane of each chord (upper and lower *lateral system*). With rare exceptions a lateral system consists of two crossed diagonal members in each panel length of the trusses, and transverse members at the panel points running direct from truss to truss. In the plane of the floor the main transverse beams serve also as lateral struts, so that only the diagonals have to be added. Such a lateral system constitutes a horizontal truss, and is analyzed as such.

Diagonal bracing in vertical transverse planes is also provided. It is essential at the ends of a bridge, where this bracing, the *portal*, transfers the wind stress of the upper lateral system down to the supports; but similar bracing of lighter character is placed at the intermediate posts of the trusses (*sway bracing*), in order to make the structure stiffer and less subject to vibration.

Stresses caused by the drag of a train when the brakes are applied have to be considered in railway bridges. They have little importance for the members of an ordinary truss bridge, but affect the fastening at the supports. In high bridges and viaducts used for elevated railways, as well as in arch bridges, cantilevers, and suspension bridges, they are of primary importance.

Truss Types. — The Howe, Warren, and Pratt trusses are the most important main or basal forms of truss, and of these the Howe is practically out of use since wooden bridges have become largely obsolete. Fig. 4, *E* shows a Warren truss; the successive web members are of equal inclination in opposite direction. One of them is a tension member, the next a compression member, and so on alternately. In the Pratt truss (*F*), there is a vertical post at each panel point, and in each panel a diagonal sloping downward toward mid-span; the diagonals all are tension members, except for possible live-load stress reversal, which is taken care of by diagonals in the middle panels, as mentioned earlier. The advantage of the Pratt truss is that the compression members are of minimum length and have the fewest oblique connections to the chords; also they provide in the simplest way for sway bracing. The Howe truss is in a sense the opposite of the Pratt, its diagonals rising toward mid-span, which makes them compression members while the verticals are in tension and in fact are always made of iron tie rods. When built of timber the Howe truss is nearly always made with crossed diagonals in each panel, and the tie rods can then be cinched up tight, which guards against derangement or sagging of the bridge from shrinkage of the wood.

In all these types the most economical proportions are secured when the diagonals slope not far from 45 degrees, which requires the panel length to be nearly equal to the truss depth. In long spans, whose trusses must be very deep (some exceed 100 feet), this would make the floor construction very costly, on account of the long panels, and the panels are therefore subdivided by auxiliary trussing. In the great Firth of Forth cantilever (Fig. 6), spanning 1,700 feet, this was accomplished by building an internal bridge inside the main structure, carrying the floor from panel point to panel point. The common practice, however, is to insert an intermediate floor beam at the middle of each panel, support it by a hanger from the middle of the diagonal above, and brace this latter point either by a sub-tie to the adjoining top-chord panel point or by a sub-post (Fig. 2) to the adjoining bottom-

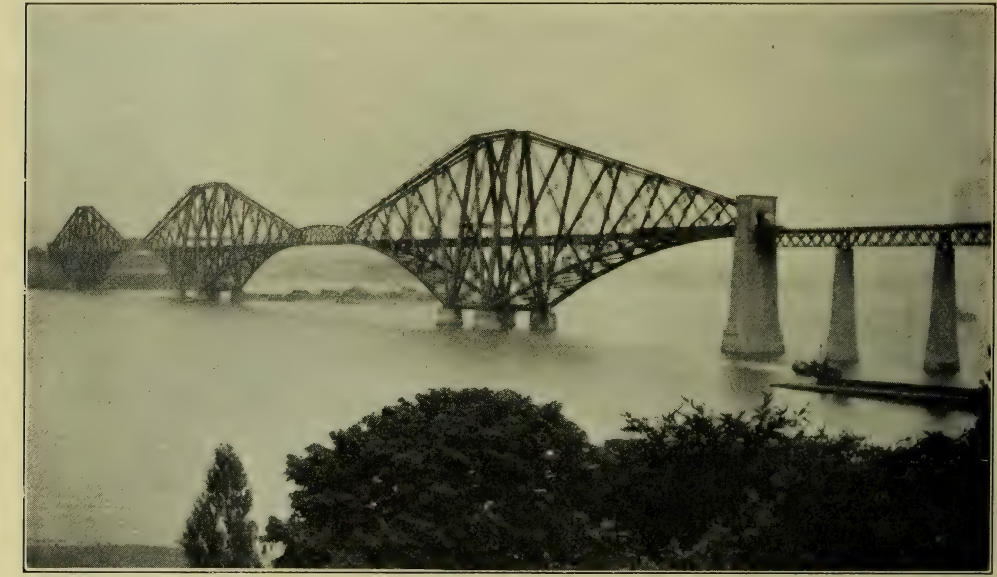


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FIG. 6.—*Firth of Forth Bridge, Scotland; 1,700 Foot Cantilever Spans*

chord point. The truss is then said to have a subdivided web system. Baltimore and Petit trusses are subdivided Pratt trusses, the latter having curved top chord. In the new Quebec Bridge, the effect of panel subdivision is attained by the arrangement of the main web members, for which the truss has been named the K-truss.

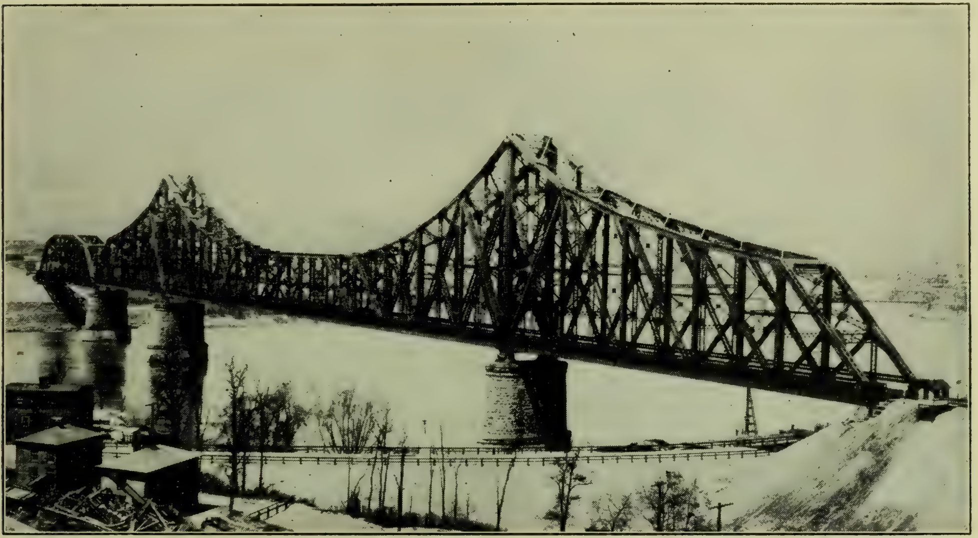


FIG. 6A.—*Beaver Cantilever Bridge, across the Ohio River (769 Feet Channel Span)*

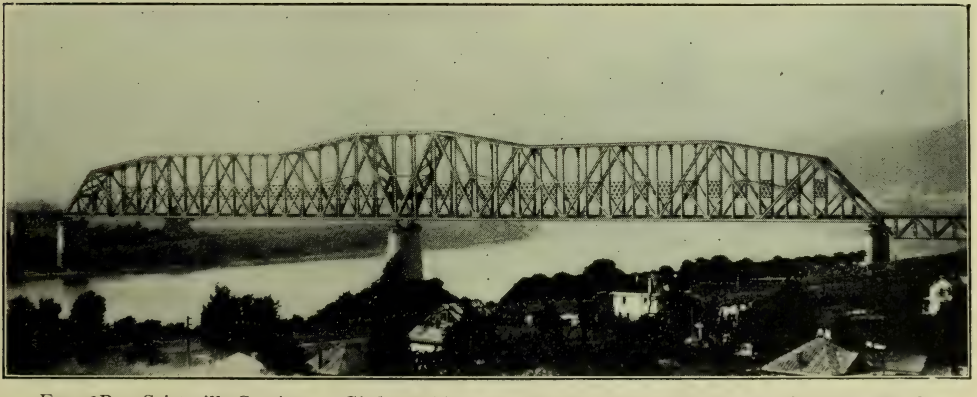


FIG. 6B.—*Sciotoville Continuous Girder Bridge across the Ohio River, Two Spans of 775 Feet Each*

Shortly after 1840 Squire Whipple of Utica invented a truss which is similar to thePratt, having vertical posts and tension diagonals, but has the posts spaced twice as close, and each diagonal crossing the next post at mid-height and connecting to the foot of the second post. This gives the advantage of short panels in simple manner, and the truss was used very extensively until after 1890, since when it has no longer been built. Indeterminate stress distribution has been often charged against it, unjustly. Whipple has the credit of publishing the first explanation of truss analysis and calculation.

The bowstring truss, having one chord in a parabolic curve and the other a straight line connecting its ends, was once much used, though now it is rare. The double parabolic or lenticular truss also was in common use in the latter part of the nineteenth century for small spans. A number of other truss forms exist, some of them still occasionally employed; but the Pratt and Warren forms with their modifications are predominant and typical. Simplicity of web system is one of the *desiderata* in selection of truss form. It is desirable also, for practical reasons, to avoid adjustable members. In the Pratt truss, *F*, Fig. 4, where counters are put in the middle panels, it is not usually possible to adjust the two opposed diagonals so perfectly during erection that both will be just taut at the same time, so that one can go into action the moment the other goes out of action (during stress reversal); for this reason the counter diagonal is made adjustable—*i.e.*, fitted with a screw turnbuckle so that it can be drawn up tight. Rods of this kind are apt to rattle, become loose, and contribute to shortening the life of a bridge. But, except in the longest and heaviest bridges, the only way to avoid adjustable members is by allowing stress reversal in some web members, which is also subject to objection. The respective advantages of the Pratt and Warren types are therefore fairly evenly balanced, from the service standpoint; the greater ease of connection in the Pratt type has made it the more widely used.

Cantilever and Continuous Bridges.—A beam resting on ordinary supports at its ends, so that under vertical loads it puts only vertical pressures on the supports, is a *simple beam,* and a truss bridge similarly supported is a *simple span,* by far the commonest type. When one end of the beam projects beyond the support, the extension is a *cantilever,* which when loaded bends so as to be convex upward. When the cantilever ends of two beam spans are brought near together, another beam may be hung with its two ends to the ends of the cantilevers, and this arrangement constitutes a *cantilever bridge.* The intermediate beam hung from the cantilever ends is the *suspended span.* Various arrangements of beams with cantilever projections, with or without suspended spans, can be made, without affecting the type classification or the nature of the structure's action. Nearly all cantilever bridges have a suspended span, but a very prominent exception is the great *Blackwell's Island* or *Queensboro Bridge* across the East River at New York, whose spans are: a west anchor arm of 469½ feet; a projecting cantilever arm of 591 feet meeting another one of the same length, and thus making a span of 1,182 feet; an anchor span of 630 feet across Blackwell's Island; another channel span of two equal meeting cantilevers aggregating 984 feet, and an east anchor arm of 459 feet. This structure, however, departs from the internal simplicity of the ordinary cantilever bridge. The stresses from dead load are determined as in ordinary cantilevers, but stresses from live load require more complex methods for analysis.

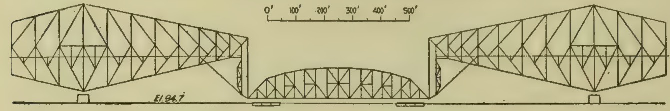


FIG. 7.—*Lifting the Suspended Span of the Quebec Bridge from Scows to the Ends of the Cantilever Arms*

Suspended span, 640 feet; whole span between piers, 1,800 feet.

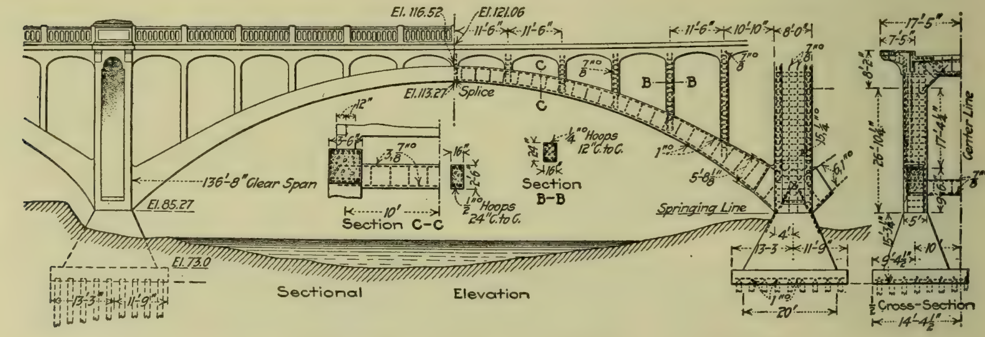


FIG. 8.—*A Reinforced Concrete Arch Span for a Country Road*

The arch has two ribs, each 3½ feet square at the crown, 16½ feet apart. Columns resting on these ribs at intervals carry, at the top, transverse beams on which the floor slab is supported. The whole is of concrete. Dash lines in the right-hand half indicate the location of steel reinforcing rods; the left-hand half shows the finished side view.

A continuous beam or girder is one that without break or articulation extends across two or more spans (three or more supports). When carrying load it bends convex downward between supports, while at and near the supports its curvature is convex upward. The point where the one curvature changes to the other is the point of no moment, or of contraflexure.

The cantilever and the continuous bridge are related, yet the former is much used while the other is rare. The practical objection to the continuous bridge is the fact that its pressures on its several supports are changed by any vertical shift of one of the supports, and thereby the stresses in the truss members are altered, which means that the bridge is weakened, or becomes less safe. Yet the continuous beam is more economical of material than the simple beam, for the same lengths of span, and it is desirable to utilize this advantage, either to save material or to obtain greater strength with the same material.

Due to the constraint or indetermination of the continuous girder, there is a shifting of the contraflexure point as the position of loads on the girder changes; and if the contraflexure can be fixed as to location the structure becomes statically determinate and free from the above-noted liability to derangement. This effect is attained by cutting the girder at one point (in case of a two-span girder), and reuniting the adjoining ends by a pin or hinge. This transforms the bridge into a cantilever structure. It will be obvious that in this latter any loads on the suspended span produce definite reactions on the ends of the cantilevers, calculated by the lever principle and not dependent on the internal makeup of the girder. And similarly all loads on the cantilevers produce reactions on the supports that are just as simply computed and allow all stresses in the structure to be determined. In contrast, the continuous girder exerts different reactions when its depth or shape of cross section is modified at any point, and therefore the true stresses cannot be found until after the whole structure has been fully proportioned.

The accompanying diagram, illustrating the procedure of hoisting the great 640-foot suspended span of the second Quebec Bridge into place, will serve to make clear the relations of parts in a cantilever bridge. The stress calculations for all loadings are quite the same for a cantilever as for a simple bridge. The type is applicable alike to short and long spans, but for short spans its specific advantages do not usually suffice to outweigh the extra complication of the joints, as well as certain other disadvantages. The prime field of the cantilever is in very long spans. Such a bridge as the Beaver cantilever (see Fig. 6A) across the Ohio in Pennsylvania (769 feet channel span) or the Sukkur bridge in India (820 feet span), is a relatively small cantilever, though exceeding by far the longest simple truss spans ever achieved (St. Louis Municipal, 668 feet; Metropolis, 720 feet). The prodigious cantilever bridges across the Firth of Forth in Scotland (1,700 feet span); the St. Lawrence at Quebec, Canada (1,800 feet); and the Queensboro, noted above, represent sizes that the simple truss shows no promise of being able to reach. One factor in the superiority of the cantilever is its concentration of the heaviest members near the supports, whereas the simple truss has its heaviest members at the middle, where they require the largest amount of material to carry their weight. But probably the main factor is the possibility of free cantilever erection, without falsework supports, a process that is only in rare cases practicable with the simple truss, and then only at the cost of serious sacrifice of strength.

The cost of very long spans is indicated by the fact that in the largest existing cantilever bridges each pound of traffic weight capacity demands 3 to 4 pounds of bridge weight to hold it up, whereas in ordinary truss bridges of considerable size the ratio is only 1 to 1½ pounds bridge weight per pound of live load.

Continuous bridges have been used to some extent on the Continent of Europe, but practically not at all elsewhere. The Fades Viaduct in France (spans 378, 472, and 378 feet) is a striking example. A very large-scale application of the continuous principle was made in America in 1916–17, however, in the Sciotoville bridge across the Ohio, which has two spans of 775 feet each (see Fig. 6B). The foundations being on rock, there is no danger of pier settlement that might derange the stress distribution. A peculiar feature of all constrained-type bridges, including the continuous type, is the necessity of making special provision during erection to insure that the structure as built will agree with the presupposed conditions. The setting of the last piece (closure) must be made in such manner as to bring a definite amount of stress into the member, in order that the truss will have such shape, that if it were lifted off its supports and laid down on its side (unstressed condition), its supports would be exactly in line, fitted to the position of the supports. It is difficult to attain the precision of shop manufacture and erection necessary to reach this result.

Arches in modern bridge practice are of several types, the most complex of which is that represented by the classical stone arch, the *fixed-end* type (see Fig. 8). If made of concrete, cast iron, or steel, there is opportunity for introducing hinges at the crown or at the springing lines, or at both crown and springing. The latter arrangement produces the *three-hinged arch*, whose action is similar to that of two rafters resting against wall plates at the heel and butted together at the peak. Like the rafters, the three-hinged arch can be analyzed by simple statics (the lever principle). But if the two rafters are lapped at the peak and rigidly spiked together, so that as one bends it makes the other bend also, we have the *two-hinged* arch, having hinges only at the springing lines. This is slightly more efficient—*i.e.*, requires slightly less material—than the three-hinged. Arches with a single hinge are not used, but arches without hinges, or

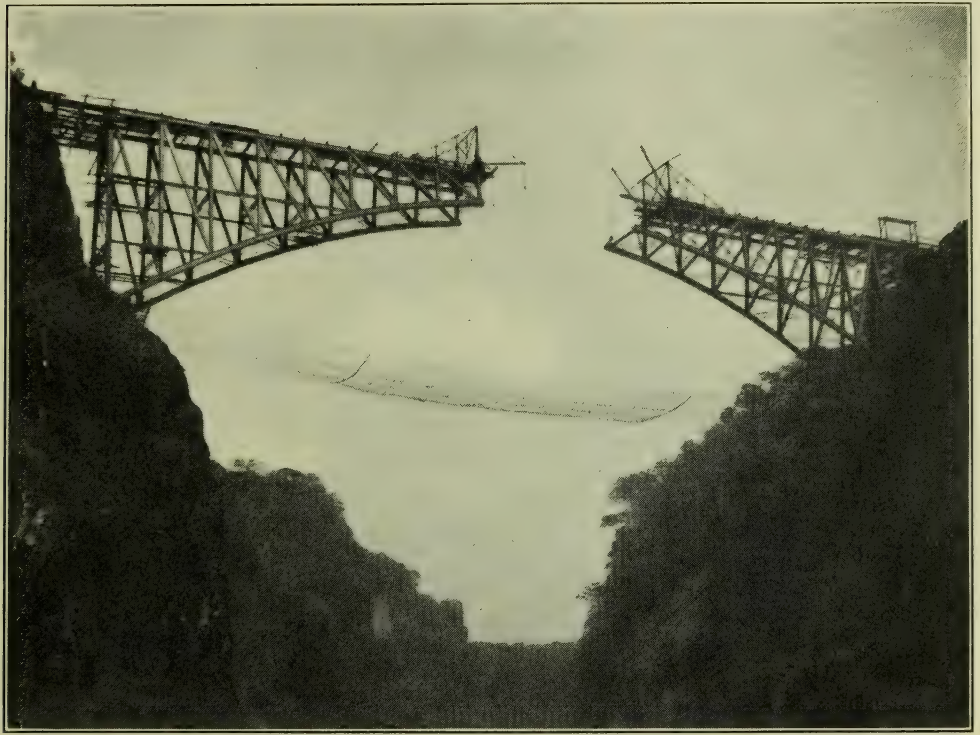


FIG. 9.—*The 500-Foot Zambezi Arch in South-Central Africa*

Cantilever arch erection is characteristically shown here. The upper end of the heel of either half must be anchored back by temporary anchorages strong enough to withstand the enormous tipping moment of the projecting mass of steel and the erection cranes working at the outer end. The rock walls of the gorge here furnished good locations for anchorage. In other cases huge triangular backstay frames loaded with enormous counterweights at the rear end have been used, as in erecting the Hell Gate arch. bridge, see article ZAMBEZI.)

fixed-end arches, are common in steel as well as stone and concrete. A few stone arches have been built with hinges.

The correct analysis of two-hinged and no-hinged arches requires methods whose nature is indicated below under *Elastic Analysis.* For masonry arches, however, it is customary to apply a simplified semi-empirical method of analysis, using a graphical process. The arch may conveniently be regarded as a suspension cable turned upside down, with compression in place of tension in the curved member. Just as the cable changes shape as the load on it is shifted, and is an *equilibrium polygon* or *funicular polygon* for the system of forces consisting of the loads and the support and anchorage reactions, so the ideal or *linear arch* is also a funicular polygon. The masonry arch must be so shaped and adjusted in ring thickness that the linear arch or *line of pressure* remains everywhere within the middle third of the ring thickness. From a force diagram a trial funicular polygon is drawn, and its pole distance so modified as to bring the polygon inside the middle third at arch crown and abutment. Thereupon the ring thickness or the arch curve or both are modified to fit the polygon. If separate polygons are drawn for full load, one side loaded, and centre half loaded, and all three have their pressure lines within the middle third, the design is sufficient, as the great strength of stone makes edge crushing of the voussoirs unlikely.

The correct elastic method of analyzing stone and massive concrete arches is usually applied by graphical means due chiefly to Greene.

The *rib arch* differs from the ordinary barrel-vault arch in having the ring composed of separate narrow ribs, on which rest columns carrying the roadway slab or deck. This form is often built in steel and concrete, rarely in stone. Steel arches are also built with ribs composed of truss meshwork (arch frames or braced arches). In hingeless and two-hinged arches the vertical reaction, the horizontal thrust, and the bending moment of the abutment vary independently, so that there are three unknowns. Three physical phenomena correspond —namely, that the supports do not yield vertically, or horizontally, or rotatively (by tipping); and translating these into mathematical terms, equated to the elastic distortions of the arch, permits of computing the three reactions. Then the stresses in all parts can be found by the methods used for simple beams and trusses.

A few very large rib arches of steel have been built, but the largest are braced arches. The *Hell Gate Bridge* (see illustration), the St. Louis arch bridge of 3 spans (500—520—500), and the *Zambezi Bridge* (see illustration) are good examples. All three were built by cantilever erection, which requires strong anchoring of the rear end of the upper chord until the arch is joined.

Suspension Bridges consist of a pair of chains or cables draped over towers and anchored at the extreme end, supporting a roadway platform by hanger rods or ropes. For given loads on the roadway, the greater the sag the less is the tension produced in the cable. When carrying a local load the cable is pulled down at the point of loading and rises elsewhere, exerting a greater lifting effect at the load, and thereby holding it up. This is the action in an unstiffened suspension bridge, as sometimes used for a light foot bridge. For more important traffic and with heavier loads, the resulting undulatory movements of the bridge floor would be objectionable, however, and the local kinking of the cable at loaded points would be injurious. Stiffening trusses are therefore attached to the roadway, the full length of the span. Their effect with regard to the cables is that a local load pulls almost equally on a number of hangers; instead of on one, thus approximating the condition of uniform load. The trusses are usually hinged at one or more points in their length.

Calculation of the cable stresses is simple, as the greatest stress occurs under full load. The tension at mid-span is the quotient of the moment of all loads on a half span about the tower support as fulcrum, divided by the sag; that at the tower is greater in ratio of the secant of the cable slope. The stresses in the stiffening trusses are statically indeterminate in complex manner, and approximate methods are employed for their calculation.

Small suspension bridges are built with stranded steel cable. The earliest suspension bridges of long spans were built in England and on the European Continent, with chains of eyebars, that is, bars or plates connected with pins. Because stiffening-truss members can be attached to these pins, the eyebar-chain construction was at first contemplated for the *Manhattan Suspension Bridge* in New York (1,470 feet). Wire cables were finally adopted, however. This bridge with two others nearby constitutes the most remarkable series of suspension bridges in existence. The earliest, the *Brooklyn Bridge*, spans 1,595½ feet and has stone towers. The *Williamsburg Bridge* (1,600 feet) has steel towers of open trussing; while the Manhattan Bridge towers are of solid steel-plate tubular makeup. All have parallel-wire cables, made by drawing thousands of single wires across the span from tower to tower, pulling them up to exactly equal tensions, tying them together, and casing the whole in a weatherproof jacket. In the last built of the three, for example, there are four cables 20¾ inches in diameter; each contains 9,472 wires of about $^3/_{16}$-inch diameter. The specific strength of the wire is slightly over 200,000 lbs. per square inch; one entire cable has a breaking strength of about 28,000 tons. The working stress is taken at 60,000 lbs. per square inch, or about 33,000 tons for all cables.

The wire cables for the Philadelphia-Camden Bridge have a diameter of 30″ and consist of 18,666 wires; those of the Detroit bridge are of 19″ diameter and have 7,622 wires. The Hudson River Bridge at Fort Lee (now under construction) will have cables 36″ in diameter with 26,474 wires in each. The largest wire-cable span (1033.5 ft.) in Europe was built (1928) at Cologne, Germany, for roadway traffic. In this bridge, however, the cables are not anchored into masses of masonry to resist the pull of the cables, but this pull is taken up by heavy compression members in the plane of the floor, carrying the thrust from one end of each cable to the other, so that only vertical anchorages are required at each end. The same principle of construction was used for three suspension bridges over the Alleghany River at Pittsburgh, in which, however, the load is carried by eyebar-chains. They have a middle span of 442 ft. The same construction was used in the wide and beautiful roadway bridge, the Kiyosu bridge in Tokio, Japan. The earlier suspension bridges were built with eyebar-chains. The most notable example of this kind was the beautiful bridge over the Danube at Buda Pest, built in 1844.

The working stress in eyebar-chains is less than in wire cables, because of their smaller tensile strength. But eyebar-chains stiffened with rigid frames directly attached to them have the advantage of greater rigidity under passing loads. A notable example is the Grand Avenue bridge in St. Louis, which is as rigid as an upright arch bridge.

Movable Bridges.—When a river must be kept open for vessels, bridges over it must either be high enough to pass the highest masts or smokestacks (125 to 160 feet), or must be movable bridges that can be swung aside or up to clear the channel. For such service the swing bridge was exclusively used in former years. It consists of a plate-girder or truss bridge mounted on a single support that can turn on a pivot or circular roller turn-table. Railway swing bridges have been built to lengths of over 500 feet (giving two channel openings of about 240 feet each), but bascule and vertical-lift bridges, whose nature is illustrated in the accompanying figures (10 and 12) were introduced after 1880, and came into wide use. Lift bridges are simple spans hung from cables passing over great sheaves at the tops of high steel towers at either bank, within which are counterweights attached to the ends of the cables to balance exactly the weight of the bridge. Auxiliary ropes serve for pulling the span up or down. Several different types of bascule bridges have been built, the Scherzer rocking on a curved heel resting on a horizontal track, the Strauss, Rall, and others having trunnions; all of them employ counterweights that balance the span in every position, so that the operating machinery has to overcome only the friction. Steam engines were formerly used to operate large movable bridges, but now oil engines and electric motors are preferred. Winches for operating the bridge by hand are always provided. Both lift and bascule bridges have been applied to channel openings over 225 feet wide, about the largest navigation width required. The lift deck of the Missouri River bridge at Kansas City spans 425½ feet, but there is a truss above it, from which the lower deck is lifted at every panel point. Bascules may be single leaf (opening from one side) or double leaf; the latter type may be arranged to act as an arch when closed, the two leaves butting together at a crown hinge.

In the wide range of conditions presented to the bridge engineer, miscellaneous bridge types are occasionally required. The *pontoon bridge* is one of these; only a few are in existence, the most modern being the *Golden Horn Bridge* in Constantinople, built by German engineers. The *ferry bridge*, of which six or seven have been built, comprises a fixed bridge high enough above the river to clear all vessels, and a truck or car running along this truss, carrying by hangers a platform not far above river level, at the height of the banks. This arrangement serves precisely like a ferry, but is not dependent on water conditions. In some of these structures (in France) the bridge is of suspension type, in others (Duluth, Minn.) of rigid truss type. The latest, at Bordeaux, spans 1,312 feet.

Deflections of bridges must often be computed. An ingenious graphical device for this purpose is the Williot diagram, which is of the same general nature as the stress diagram of a truss, but is laid off with sides equal to the respective length changes of the members and in directions at right angles. Indirectly the deflections are involved in the calculation of internally constrained structures by

Elastic Analysis, which is a calculation of the deformations of two separate parts or component systems of a structure, and a subsequent calculation based on equating the two distortions computed for the same point. This is also required in structures that are externally constrained. If in the truss Fig. 4, *E*, a new member be added, not essential to keeping the truss rigidly in shape, this member is strained whenever the truss is loaded, and thus it relieves the truss of part of its former stresses. The division of stress between the new member and the others is bound to be such that the new piece stretches or shortens just as much as the corresponding distance in the original truss. Expressing this fact mathematically furnishes a condition from which the share of stress taken by the added member can be computed. The most obvious case of external constraint is that of a two-hinged arch. Here, if the abutment at one end be removed and a simple flat bed plate substituted, the arch is transformed into a simple truss. The horizontal yielding or deflection of the end on the bed plate can be calculated for a particular loading. Next the amount is calculated by which a horizontal pull of one pound from abutment to abutment would pull the arch truss together; if this is found to be $^1/_{10,000}$ inch, for instance, and the first-computed yield was 2 inches, then by applying a horizontal pull of 20,000 lbs. to the truss ends we would pull the structure back into its original position. Since the actual arch is in just this position, it must experience an abutment reaction of the precise amount of 20,000 lbs., so that this is the arch thrust which was the unknown at the start of the calculation. Further development of this general method is capable of dealing with all problems in constrained structures.

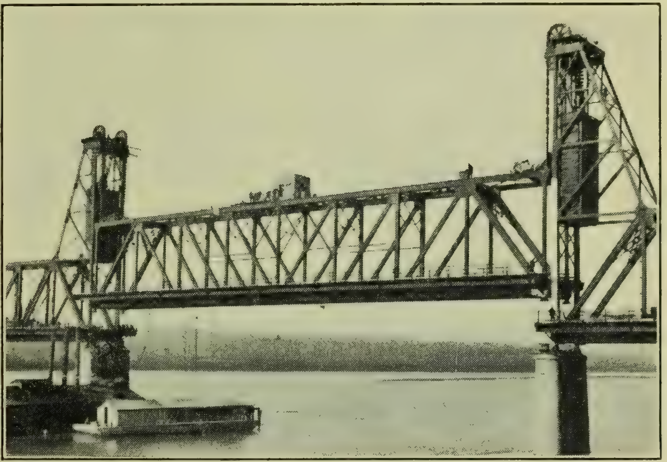


FIG. 10.—*Vertical Lift Bridge Over the Arkansas River*

The movable span is supported by chains passing over sheaves at the tower tops to the heavy concrete counterweights seen part way down. Electric motors in the machinery house on the middle of the span wind up operating ropes that pass from the ends of the span up and down along the towers, thereby lifting or lowering the span.

The *least work* method is another form of procedure. It bases on the theorem that in a constrained elastic system the constraints will adjust themselves to such deformation amounts that the total work of the system is a minimum, consistent with the governing static equilibrium conditions. It can be derived, however, from the deflection-equation method above noted, and is equivalent to it, though applied by other procedure (calculus differentiation). Either form of calculation becomes very intricate when there are many unknowns. The hingeless arch has three: the vertical reaction, the thrust, and the end moment, which require three simultaneous equations to be solved. One physical interpretation of this mathematical relation is that movements or defects in three different directions can vitiate or alter the stresses existing in

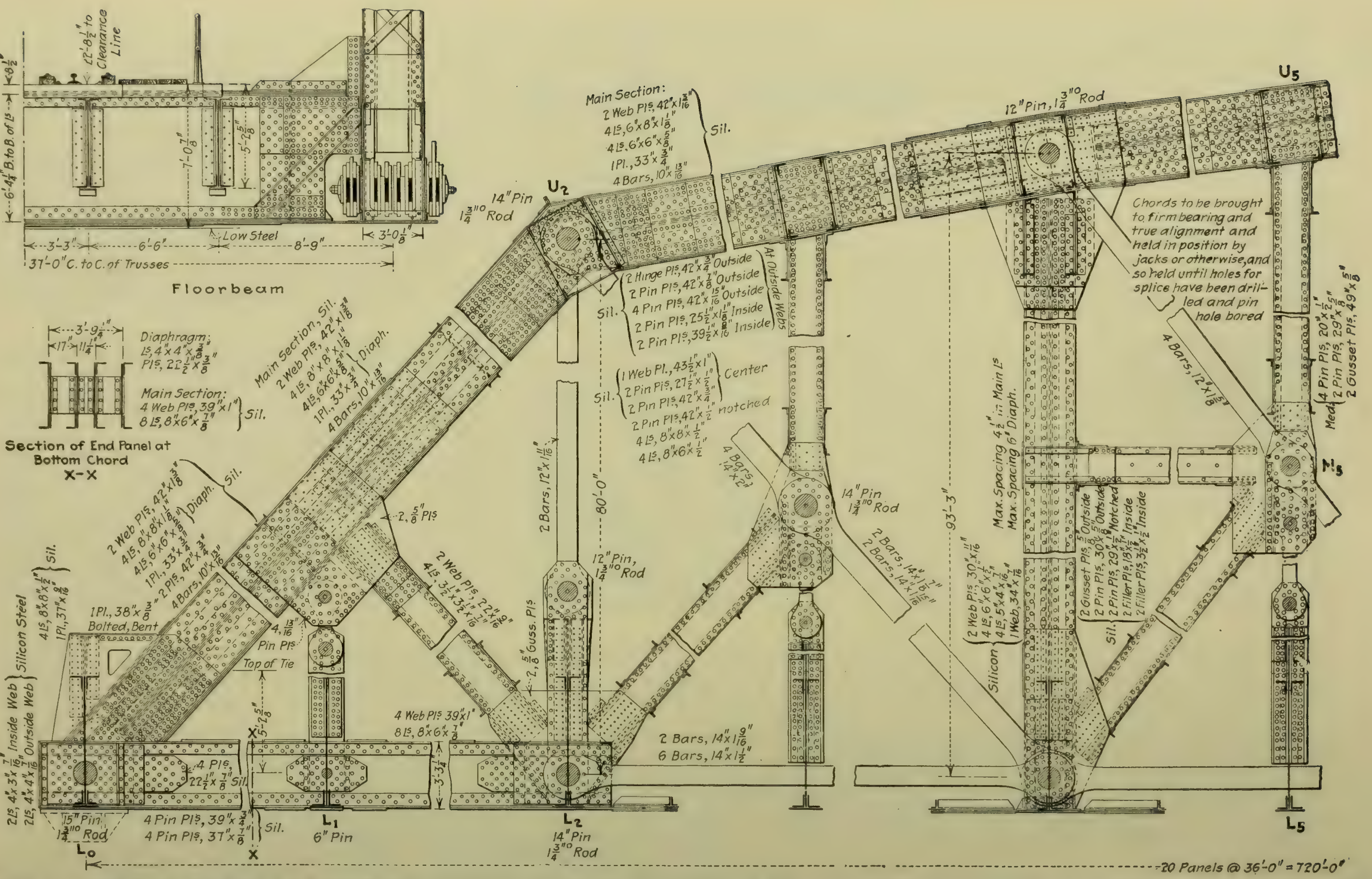

Floorbeam
37'-0" C. to C. of Trusses
Low Steel
22'-8½" to Clearance Line
6'-4¼" B. to B. of Ls
Section of End Panel at Bottom Chord X-X
Diaphragm; Ls, 4"x4"x⅜" Pls, 22½"x⅜"
Main Section: 4 Web Pls, 39"x1"; 8 Ls, 8"x6"x⅞" Sil.
Main Section, Sil. 2 Web Pls, 42"x1⅛"; 4 Ls, 8"x8"x1⅛"; 4 Ls, 6"x6"x⅝"; 1 Pl., 33"x¾"; 4 Bars, 10"x1 13/16" Diaph.
Main Section: 2 Web Pls, 42"x1 3/16"; 4 Ls, 6"x8"x1⅛"; 4 Ls, 6"x6"x⅝"; 1 Pl., 33"x¾"; 4 Bars, 10"x1 13/16" Sil.
2 Hinge Pls, 42"x¾" Outside; 2 Pin Pls, 42"x⅞" Outside; 4 Pin Pls, 42"x15/16" Outside; 2 Pin Pls, 25½"x1" Inside; 2 Pin Pls, 39½"x⅝" Inside; At Outside Webs
1 Web Pl., 43½"x1"; 2 Pin Pls, 27½"x½" Center; 2 Pin Pls, 42"x¾"; 2 Pin Pls, 42"x½" notched; 4 Ls, 8"x8"x½"; 4 Ls, 8"x6"x½"
U2
U5
L0
L1
L2
L5
M5
X
14" Pin 1¾" ⌀ Rod
12" Pin, 1¾" ⌀ Rod
15" Pin 1¾" ⌀ Rod
6" Pin
2 Bars, 12"x1 11/16"
4 Bars, 14"x2"
4 Bars, 12"x1⅝"
2 Bars, 14"x1 7/16"; 2 Bars, 14"x1 15/16"
2 Bars, 14"x1 9/16"; 6 Bars, 14"x1½"
2 Web Pls, 22"x9/16"; 4 Ls, 3½"x3½"x7/16"
2, ⅝" Pls
2, ⅝" Guss. Pls
4, 13/16" Pin Pls
Top of Tie
1 Pl., 38"x⅜" Bolted, Bent
2 Ls, 4"x3"x7/16" Inside Web; 2 Ls, 4"x4"x7/16" Outside Web; Silicon Steel
4 Ls, 8"x8"x½"; 1 Pl., 37"x9/16" Sil.
4 Pls, 22½"x⅞" Sil.
4 Pin Pls, 39"x¾"; 4 Pin Pls, 37"x⅞" Sil.
4 Web Pls 39"x1"; 8 Ls, 8"x6"x⅞"
2 Web Pls, 30"x11/16"; 4 Ls, 6"x6"x½"; 4 Ls, 5"x4"x7/16"; 1 Web, 34"x7/16" Silicon
Max. Spacing 4½" in Main Ls; Max. Spacing 6" Diaph.
2 Gusset Pls, ⅝" Outside; 2 Pin Pls, 30"x⅝" Outside; 2 Pin Pls, 29"x½" Notched; 2 Filler Pls, 18"x½" Inside; 2 Filler Pls, 3½"x½" Inside Sil.
4 Pin Pls, 20"x½"; 2 Pin Pls, 29"x⅝"; 2 Gusset Pls, 49"x⅝" Med.
Chords to be brought to firm bearing and true alignment and held in position by jacks or otherwise, and so held until holes for splice have been drilled and pin hole bored
80'-0"
93'-3"
3'-3¼"
5'-2⅝"
20 Panels @ 36'-0" = 720'-0"

FIG. 11.—PART OF DETAIL DRAWING FOR 720-FOOT SPAN OF METROPOLIS BRIDGE OVER OHIO RIVER—A TYPICAL PIN-CONNECTED STEEL STRUSS BRIDGE

the hingeless arch. Being thus sensitive to mechanical derangement, constrained structures are usually avoided in bridge work. With rock foundations and accurate workmanship in construction, the objection loses force, and the superior economy of the type is then a decisive advantage.

As a truss deflects when loaded, and even under its own weight the shape of every part of the meshwork changes slightly, and this means that the angle between any two adjacent members becomes a trifle larger or smaller. The connection of one member to its neighbors is rigid, however, and does not permit this change of angle; in consequence the members must bend a little as the truss deflects. Though the bending is extremely slight, yet it suffices to set up very considerable extra stresses in the members, which reduce the ability of the material to bear the normal service stresses (direct stresses). Numerous computations of these *secondary stresses* in representative truss bridges show that they are often as large as 25 or 40 per cent. of the direct stresses, and in some instances may be 75 to 100 per cent.; *i.e.*,, they nearly or quite double the tax on the member, and thus cut its available strength in half.

Expansion Effects occur in all bridges, due to the large variations of atmospheric temperature to which they are exposed. For a steel bridge the full range of 100° F. may be assumed in ordinary climates. A 200-foot span will change in length about 1½ inches due to this range. Beam and simple truss spans are mounted on a sliding or (in spans of 80 feet and over) on a roller bearing at one end. Various other precautions must be taken in bridge structures to guard against expansion effects. Arches that are fixed rigidly between their abutments cannot expand endways, but a three-hinged arch can rise at the crown as it expands, without any stress effects. In two-hinged and hingeless arches, however, large *temperature stresses* result, which have to be computed and allowed for by adding extra material to resist them. Masonry structures undergo much smaller variations of temperature than steel, but on the other hand, the effect of a given expansion movement is much more serious, and more difficult to neutralize.

Bridge Loads. — Highway bridges are usually designed for distributed loads of 100 to 150 lbs. per square foot of floor, besides the weight of the bridge and floor; and for concentrated loads represented by a road roller or a motor truck weighing 10 to 20 tons. Railway bridges are designed for traffic loads of about 4,500 to 6,000 lbs. per lineal foot of track; but in most cases the actual wheel distribution and wheel loads of the heaviest trains used on the railroad are taken as the basis of stress calculation. Two locomotives having driver-axle loads of 50,000 to over 75,000 lbs. spaced 5 feet apart, and a uniformly distributed load of 6,000 lbs. per foot, to represent the cars, are a widely used design loading. Wind loads are taken as 20 to 30 lbs. per vertical square foot of bridge and train, or as 300 to 500 lbs. per lineal foot of bridge.

In railroad bridges an *impact addition* is made to the traffic load or *live load*, in recognition of the pounding and vibration which trains produce. For steel bridges the amount of addition depends on the span of the bridge, the service of the particular member, etc. It is greatest for short spans and for those members that receive full stress at each passage of a train, and in this case is as high as 100 per cent. (*i.e.*, the live load stress is doubled). It becomes practically zero for the chords of a bridge over 300 feet in span.

Bridge Details, in the case of steel bridges, involve a high degree of complexity and many design principles that cannot be set forth in brief form. The full-page drawing, Fig. 11, shows part of the detail for a large modern bridge. Its compression members are hollow (box-shaped) assemblages of plates and angles riveted together at their edges. The tension members in this structure are *eyebars*, thick flat steel bars forged at the ends to form large round eye-holes receiving a *pin* or round steel bar which may be as much as 16 inches in diameter, connecting it to the other members. This bridge is *pin connected*, as are most long-span bridges. In short spans it is better to make all connections by riveting. Rivets, which are the essence of steel bridge construction, are pieces of round steel rod ⅝ to 1¼ inch in diameter passing through holes punched or drilled in the parts to be connected. Both ends of the rivet are headed over by hammer forging (or by pressure), one head being made before the rivet is used, and the other after inserting the red hot rivet in its hole. The frictional grip of the rivet on the plates which it connects is due to its contracting while cooling after the 'point' is headed up. This grip is the main element of strength in a riveted connection, although rivet joints are propor-

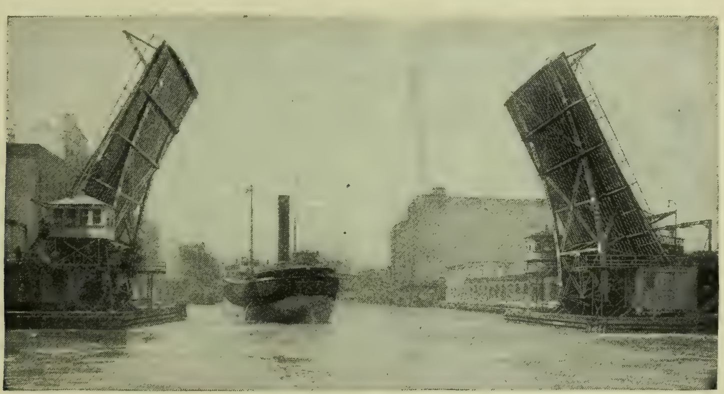


Fig. 12.—*Scherzer Rolling Lift Bridge (Open), Crossing Chicago River*

Movable span in two leaves, giving clear waterway of 140 feet in width. Width of bridge, 63 feet 3½ inches.

tioned as though the shearing and side-bearing resistance of the rivet were brought into play.

The field construction or *erection* of bridges is illustrated by means of photographs shown with this article. Stone and concrete arch bridges are built on a supporting frame, the centring, shaped to the arch curve, on which stone arch blocks can be laid directly; or for a concrete bridge, suitable moulds (*forms*) are set up. Erection of steel bridges demands the use of powerful and often highly elaborate hoisting machinery. The procedure varies with the particular piece of work—plate-girder spans are commonly set up in place as fully assembled spans, while truss bridges are erected either on falsework (Fig. 5) or by free-projection or cantilever method. The erection problem is in many cases the most serious and difficult part of the construction of a bridge.

Public Supervision of bridge construction has developed since 1900, in recognition of its relation to public safety. In the United States most States maintain bureaus for supervising highway bridge work, and the public utilities commissions (q.v.) of many States inspect and approve railway bridge construction. The governmental inspection in some cases extends to the matter of maintenance, railway bridges being inspected at frequent intervals by the public utilities engineers in some of the States. A system of acceptance testing by putting full load on the bridge after completion and observing the deflections is current in some European countries.

Permanence.—The life of well-built and well-maintained bridges is very great, but definite figures cannot be stated. Stone bridges have lasted for many hundred or even several thousand years. They are subject to deterioration of the mortar joints, calling for occasional pointing up; but beyond this, with good foundations, the bridge will be as enduring as the stone, and may be considered everlasting in most cases. Concrete bridges will doubtless prove to have very long life, but experience with them is as yet too short for certain prediction. Iron bridges have in a few instances remained in service for nearly fifty years; and except that they had become too light for the increased modern traffic loads, they might have continued in use indefinitely. They should be kept well painted, as deterioration from rust is very rapid. Wooden bridges have endured as long as one hundred years, but this must be regarded as fortuitous in view of the ever-present risk of decay and fire. In general, modern bridge experience may be summarized by the statement that bridges have become obsolete from increase of traffic loads or through other causes before any natural limit to their length of life appeared. Railway bridges, particularly, have in the last forty years rarely continued in service longer than twenty-five years, when replacement by a bridge designed for heavier loads was demanded. Present-day practice recognizes the desirability of providing ample margin for future growth of bridge loads.

Bibliography.—Consult Waddell's *Bridge Engineering;* Johnson, Bryan and Turneaure's *Modern Framed Structures;* Merriman and Jacoby's *Roofs and Bridges;* Kunz's *Design of Steel Bridges* (1914); Burr's *Suspension Bridges, Arch Ribs and Cantilevers* (1913); and *The Design and Construction of Metallic Bridges* (1912); Swain's *Structural Engineering* (1927). The works of Cain and Howe on *Arches*, those of Hudson and Moore on *Plate Girders*, and that of Steinman on *Suspension Bridges* may also be noted.

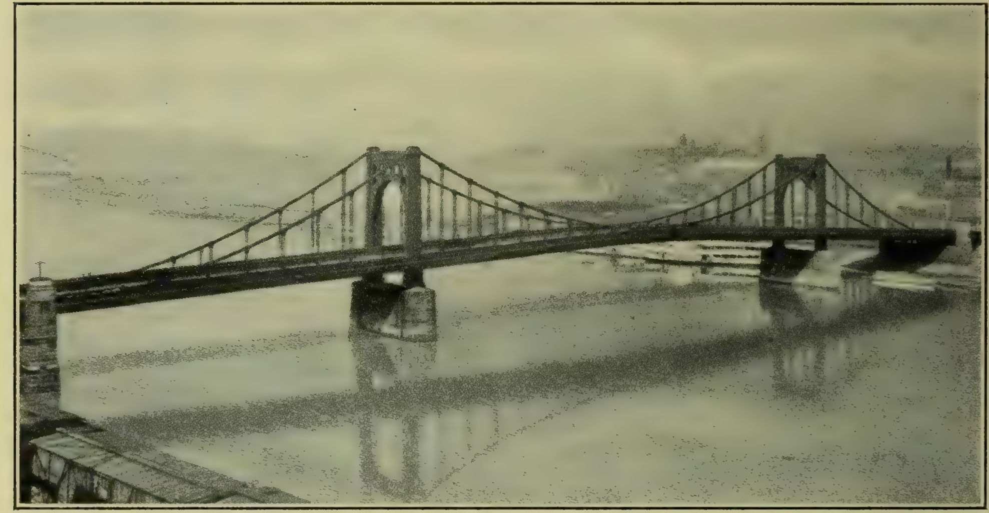


FIG. 13.—*The New Sixth Street Chain Bridge over the Allegheny River in Pittsburgh, Pennsylvania, Span 442 feet*

Bridges, ROBERT (1858–), American editor and author, was born in Shippensburg, P. He was graduated from Princeton in 1879 (A.M., 1882) and became a reporter for the Rochester *Democrat and Chronicle* (1880). He has been assistant news editor of the New York *Evening Post* (1881–7), and assistant editor (1887–1914) and editor (since 1914) of *Scribner's Magazine.* Under the pseudonym 'Droch' he was literary reviewer for *Life* from 1883 to 1900. He is a member of the National Institute of Arts and Letters. His published works include *Overheard in Arcady* (1894); *Suppressed Chapters* (1895); *Bramble Brae* (verse, 1902); *The Roosevelt Book* (1904). He has received several honorary degrees.

Bridges, ROBERT SEYMOUR (1844–), English poet and critic, was born in Walmer, Kent. He was educated at Oxford and studied medicine at St. Barthol-

Died apr. 21, 1930

omew's, London, and practised in London until 1882. While in London, Mr. Bridges had become known to a small circle as a fine writer of delicate lyric poems with an Elizabethan ring. Since 1882 he has devoted himself seriously to literature; writing, besides lyrics, narrative poems, sonnets, and a series of interesting plays in various experimental manners. The following are some of his works:—Poems: *The Growth of Love* (1876; enlarged 1890); *Eros and Psyche* (1885; revised 1894); *Eden: an Oratorio* (1891); *Purcell Commemoration Ode*, etc. (1896); Plays: *Prometheus the Fire-giver* (1883, 1884); *Nero* (two parts, 1885); *Feast of Bacchus* (1889); *Christian Captives* (1890); *Humors of the Court* (1893). Poetical works: Complete ed. in progress (1903); *Criticism*, etc.; *Milton's Prosody* (new ed. 1893); *John Keats* (1895, 1896), in Muses' Library.

Bridget, St. (1302–73), was born near Upsala, Sweden; after a pilgrimage to St. James of Compostela in Spain, retired (1344) to a convent, where, in answer to her prayers, the rule of 'the Saviour's Order after the reformed rule of Augustine' was revealed to her, and she built the first monastery of the order on her own estate of Vadstena, in E. Gothland—a monastery which continued to flourish until its suppression in 1595. Bridget repaired in the jubilee year 1350 to Rome, where she lived till her death—a residence only interrupted by a pilgrimage to Jerusalem in 1372. On her death her body was conveyed to the monastery of Vadstena. She was canonized in 1391. Her day is October 8.

Bridget, St., of Ireland. See Brigit.

Bridgeton, city, N. J., the co. seat of Cumberland co., 37 m. s. of Philadelphia, on both sides of the Cohansey R., and on the Central of New Jersey and other R. Rs. It is the seat of the West Jersey Academy, South Jersey Institute, for both sexes, and Ivy Hall Seminary for Girls. It is a port of entry, being at the head of navigation and of the tidal waters of the river, and carries on a large trade in pig iron and ore, lumber, lime, and coal. Considerable shipments of grain are made. The manufactures include nails, glass, woollen goods, flour and canned goods. Pop. (1910) 14,209.

Bridgetown, seapt. and cap. of Barbados, W. Indies, on the N.E. shore of Carlisle Bay, a fine spacious roadstead affording safe anchorage for the largest ships, and situated on the W. coast of the island. It is a port of call for steamers, and the headquarters of the Royal Mail Steamship Company. The exports include sugar, molasses, aloes, and mineral oil. The total trade is valued at about $10,000,000 annually. It is the seat of the bishop of Barbados. Pop. over 21,000.

Bridgewater, tn., Plymouth co., Mass., 26 m. S. by E. of Boston, on the N. Y., N. H. and H. R. R. It is the seat of a state normal school and of a state almshouse. The town has a public library and diversified manufactures, including cotton-gin, cotton, shoe, and tack factories, iron works, brickyards, paper mill, etc. It was settled in 1645. Pop. (1910) 7,688.

Bridgewater, Francis Egerton, third Duke of (1736–1803), succeeded to the title on the death of his elder brother (1748). On the advice of James Brindley, he constructed a canal (1758–71) which was 77½ m. long, and spanned the Irewell from Worsley to Manchester (afterward extended to the Mersey), at an expenditure of £220,000. In 1887 the canal was sold to the Manchester Ship Canal Company.

Bridgewater, Francis Henry Egerton, eighth Earl of (1756–1829), son of John Egerton, bishop of Durham (1721–87), succeeded his brother in 1823. He lived for years at Faris, where the Hôtel Egerton was notorious for its swarm of cats and dogs dressed as human beings, and its flocks of birds with clipped wings in its gardens. In addition to bequeathing £12,000 to the British Museum to buy MSS., he left £8,000 to be given for the best work 'On the Power, Wisdom, and Goodness of God, as manifested in the Creation,' to be awarded at the discretion of the president of the Royal Society, and by him allocated to—(1) Dr Chalmers, *The Adaptation of External Nature to the Moral and Intellectual Constitution of Man*, 1834; (2) Dr. William Prout, *Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology*, 1833; (3) Rev. William Kirby, *On the History, Habits, and Instincts of Animals*, 1833; (4) Dr. Kidd, *The Adaptation of External Nature to the Physical Condition of Man*, 1833; (5) Sir Charles Bell, *The Hand, its Mechanism and Vital Endowments, as evincing Design*, 1834; (6) Dean Buckland, *On Geology and Mineralogy*, 1836; (7) Dr. Whewell, *Astronomy and General Physics, considered with reference to Natural Theology*, 1833; (8) Dr. P. M. Roget, *Animal and Vegetable Physiology, considered with reference to Natural Theology*, 1834. These form the *Bridgewater Treatises*.

Bridgman, Elijah Coleman (1801–61), American missionary, was born in Mass., and graduated (1826) at Amherst. He graduated at Andover theological seminary, 1829, and went to Canton, China, the same year as assistant to Dr. Morrison. He acted as interpreter for both Chinese and American officials, and prepared a *Chrestomathy*, or manual of the Cantonese dialect, the first of its kind. Mr. Bridgman founded a mission station at Shanghai, and printed his version of the Bible there. He also founded the *Chinese Repository*.

Bridgman, Frederick Arthur (1847), American painter, was born at Tuskegee, Ala., and developed talent as an artist at a very early age. He went to New York at the age of sixteen, and after working for an engraving company studied at the National Academy schools, and subsequently at the Ecole des Beaux Arts in Paris for five years, adopting Gérôme as his master. He exhibited pictures of Breton life at the Salon, and painted in Algiers, Spain, and Egypt. Mr. Bridgman paid a visit to New York in 1880, and was made an Academician the following year, but located his studio in Paris, at whose exhibitions, and elsewhere on the Continent, he received several medals. Some of his paintings are *The Breton Children in Carnival Time, The Funeral of a Mummy, A Moorish Interior, Summer on the Bosphorus, Roumanian Lady*, and *Diligence in the Pyrenees*.

Bridgman, Herbert Lawrence (1844), American journalist, was born at Amherst, Mass., and graduated (1866) at Amherst. After some years of newspaper work he became associate editor of the Brooklyn *Standard-Union*. Mr. Bridgman accompanied the Peary auxiliary expedition of 1894, and was in command of the expedition of 1899, and he took part with Prof. Libbey of Princeton in the scaling of the *Mesa Encantada* in New Mexico, 1899.

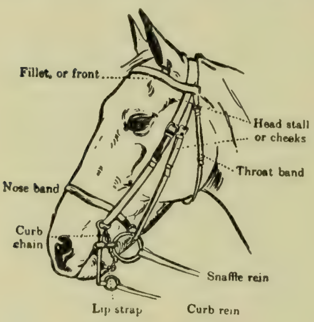
Bridgman, Laura Dewey (1829–89), a native of Hanover, N. H. At the age of two, as the result of an attack of fever, she lost sight, hearing, smell, and (partly) taste, and, along with these, the power of speech. From the age of eight years and onwards, under the tuition of Dr. Howe of Boston, she acquired the power of reading and speaking with her fingers; and subsequently she learned geography, history, algebra, and even acquired proficiency in needle-work and household duties; while she was an adept at teaching others similarly afflicted. An analogous case is that of Helen Keller (q.v.). See *Life and Education of Laura Dewey Bridgman*, by Miss Lampson (1878).

Bridgnorth, munic. bor. and mrkt. tn., Shropshire, England, on Severn; has industries of carpet weaving, worsted spinning, tanning, and matting. Thomas Percy, author of *Reliques of Ancient English Poetry,* was born here in 1728. Pop. (1911) 5,768.

Bridgton, tn., Cumberland co., Me., on the Bridgton and Saco River R. R., 40 m. N.W. of Portland. It has an iron foundry, tannery, woollen mills. Pop., 3,000.

Bridgwater, munic. bor., seapt., and mrkt. tn., Somersetshire, England, on the Parret; trades with the U. S., W. Indies, Canada, etc.; exports earthenware, cement, and bricks. Monmouth was proclaimed king in the old castle in 1685. Admiral Blake was born here in 1598. Pop. (1911) 16,802.

Bridle, the head harness of a horse or other beast of burden. Bridle bits are of three kinds—snaffles, curb bits, and stiff bits. The snaffle has two bars, jointed together in the middle, with rings at the ends for the reins. It sometimes has cheek-pieces to prevent the ring pulling into the horse's mouth. The curb bit comprises cheek-pieces or branches with eyes for the cheek-straps and the reins, and holes for the curb-chain; a mouth-piece, uniting the cheek-pieces and forming the bit proper, sometimes a bar uniting the lower ends of the branches; and a curb-chain. The elastic bit consists of a chain covered by closely-coiled wire between the bit rings. Another form of elastic bit is made of twisted wire with a soft rubber covering.



Parts of Bridle.

A double-ringed snaffle will suit almost any horse; and if a little extra power is needed, a jointed or twisted snaffle may be used. In particular cases, the sliding mouth bits and those having small ports may be resorted to; but they are frequently used when there is no need for them, and when the simple bits, if properly placed on the bridle, would be sufficient. If a bit is very tight, a horse cannot be expected to obey his driver, as it deprives the mouth of feeling.

Bearing reins—to which many are opposed—are used for supporting the horse's head, and in the simple form are attached to a loop in the bit, from which they are carried through a loop or swivel attached to the throat, and then to the tenet on the pad. In its more powerful form the bearing rein is known as the gag. In this case it is attached to a billet stitched to the head-piece, and is passed through a swivel on the end of the gag, and then to the tenet. Two bits are used at once with the gag, one being the ordinary driving bit and the other a bridoon bit, which is usually jointed in the centre and fitted with a ring or swivel at each end for attaching the bearing rein.

Bridlington, or BURLINGTON, par. (12,562 ac.) and mrkt. tn., Yorkshire, England, 11 m. N.E. of Driffield. One mile to the S.E., on Bridlington Bay, is the popular watering-place Bridlington Quay. The harbor has two stone piers, and the bay, protected by Flamborough Head and the Smithwick Sand during northerly gales, forms the only safe anchorage on the east coast of Britain between Harwich and Leith. Pop. (1911) 14,334.

Brief. In the judicial procedure of the United States, the abstract or outline of his argument which a lawyer submits to the court on appeal. It should contain a brief statement of the judicial history of the case and of the facts elicited at the trial, followed by an enumeration of the legal 'points' to be argued and supported, with a citation of authorities under each. Such a 'brief on appeal' is usually printed for the use of the court and opposing counsel. The term, brief, is sometimes employed by lawyers also to describe the memorandum of facts to be proven and law involved in a case, which is prepared to aid them on the trial. This is known as a 'trial brief.' In England, a brief is the memorandum of instructions drawn up by an attorney for the guidance of the barrister, containing a statement of the facts, points of law, etc., to be developed and expanded before the court, or to be used in the cross-examination of witnesses. As soon as counsel is 'briefed' he has authority to act as his client's representative in all matters involved in the litigation. The brief is always endorsed with the title of the court and of the action, and with the names of the counsel and of the solicitor who delivers it.

Brief, PAPAL, a state document from the Pope to an individual or to a religious community, giving advice or exhortation upon matters of difficulty or of discipline. It is dated *A die Nativitatis* and sealed with the Pope's signet ring, the seal of the fisherman; while a bull is dated *A die Incarnationis,* and is signed by the functionaries of the papal chancery. A brief also differs from a papal bull in being of a less formal and weighty character.

Brieg. (1.) Town, prov. Silesia, Prussia, on high ground on the l. bk. of the Oder, 26 m. by rail S.W. of Breslau, cap. of the former duchy of Brieg (1348–1675). The castle (1544) of the former dukes, with a fine façade, is now a storehouse. Pop. (1900) 24,090. (2.) Also called BRIG and BRIGUE, small and picturesque tn., canton Valais, Switzerland, at beginning of ascent to the Simplon Pass, and at Swiss mouth of the tunnel, 90½ m. by rail from Lausanne, and 15 m. below the hospice on the summit of the Simplon. Alt. 2,244 ft. Pop. (1900) 2,182.

Briel, or BRIELLE, fort., seapt., tn., prov. S. Holland, Netherlands, at the mouth (S. bank) of the New Maas, and on the island of Voorne. It is the birthplace of Admiral M. Tromp. Its capture by the patriotic Beggars of the Sea (Gueux) in 1572 marked the beginning of the war of independence against Spain. Pop. of comm. (1899) 4,162.

Brienne, JOHN I., COUNT OF (1148–1237), king of Jerusalem and emperor of the Latin empire of Constantinople, in 1212 became king-regent for his daughter Yolande. In 1218 he took part in the fifth crusade, led by Andrew, king of Hungary, and besieged Damietta, which capitulated in 1219. In 1225 he married his daughter to the German emperor Frederick II., with the condition that he should remain king of Jerusalem for life. But as Frederick did not observe this condition, John was driven to seek refuge at the papal court. In the quarrel between Pope Gregory IX. and the Emperor Frederick, John commanded the papal forces, but was defeated in 1229. In the same year the barons of Constantinople elected him emperor, during the minority of Baldwin II. In this capacity he defeated the united forces of the Greeks and Bulgarians (1238) See E. Georges' *Jean de Brienne* (1858).

Brienne le Château, or BRIENNE NAPOLÉON, dist. tn., dep. of Aube, France, 26 m. by rail E.N.E. of Troyes. At its military school Bonaparte was educated. There are breweries and candle factories. Pop. (1901) 1,753.

Brienz, a considerable village in the Swiss canton of Bern, and the centre of the wood-carving industry. It is the starting-point of the railway up the Brienzer Rothhorn. Brienz is built at the N.E extremity of the lake of the same name (11½ sq. m. in area, 1,857 ft. above the sea-level, and 853 ft. in depth), opposite Giessbach waterfall. Pop. (1900) 2,580.

Brierley, BENJAMIN (1825–96), writer and poet in the Lancashire dialect, was born at Failsworth, near Manchester, England. In 1863 he became sub-editor of the *Oldham Times*, and in 1864 his first story, *The Layrock of Langleyside*, appeared. In 1869 he started the publication of *Ben Brierley's Journal*, first as a monthly and then as a weekly magazine, and continued to edit it until 1891. He also published *Irkdale* (1865), *Marlocks of Merriton* (1867), *Red Windows Hall* (1867), *Ab-o'-th'-Yate in London* (1868), *Cotters of Mossburn* (1871), *Home Memories* (1886), *Cast upon the World* (1887), and *Spring Blossoms and Autumn Leaves* (1893).

Brierley Hill, eccles., par. and mrkt. tn., Staffordshire, England, on Stour R., 2½ m. N.E. of Stourbridge; has coal and ironstone mines, and deposits of fireclay, which have been worked for centuries. The industries are glass-bottle-making, brick and earthenware manufacturing, chain, nail, and spade making. Pop. (1911) 12,264.

Brieux, EUGÈNE (1858), French dramatic author, born at Paris. He wrote his first play, *Bernard Palissy*, in 1880, but only became known in 1890, when his *Ménages d'Artistes* was represented at the Théâtre Libre in Paris; two years later he won even greater success with *Blanchette* at the same theatre. Since then he has produced several plays, mostly dealing with some social injustice or abuse, which have given rise to heated discussions, while some have been interdicted by the authorities. Brieux's characters are drawn with power and dramatic effect. Among his latest pieces are *Les Bienfaiteurs* (1896); *L'Evasion* (Comédie Française, 1896); *Les Remplaçantes* (1901); *Les Avariés* (1901); *La Robe Rouge* (1900), produced at the Garrick Theatre, London (1904), as *The Arm of the Law*, which called attention to abuses (now altered) connected with the preliminary inquiry of the *juge d'instruction*, and stirred up a violent controversy; and *Petite Amie* (1902).

Brig, a sailing vessel with two masts, both square-rigged. An *hermaphrodite brig* has also two masts, but has square sails on the foremast only, the mainmast being fore-and-aft rigged. A brigantine differs from a brig in having no square mainsail.

Brigade, a tactical body of troops organized only in time of war in the United States Army, the regiment being the largest permanent unit in time of peace. An infantry brigade consists normally of three, but sometimes of two or four regiments. A cavalry brigade consists of two or three regiments and, when acting alone, has two batteries of horse artillery attached. Separate brigades are organized from time to time for special purposes, and detached from their divisions, in which case they are supplied with a due proportion of the auxiliary arms and services depending upon the nature of the special service expected. The brigade organization originated with Turenne, Condé, and others in France and Marlborough in England, and was soon adopted in all European armies. A brigadier-general is the normal commander of a brigade, but his duties frequently devolve upon the senior colonel. See ARMY; ARMY IN THE FIELD; *Field Service Regulations, U. S. Army* (1905).

Brigadier-General, in the U. S. army, is the grade next above colonel and next below major-general. The appropriate command of a brigadier-general of the line is a brigade (q.v.). The chiefs of the several administrative bureaus of the War Department also hold this rank, with the exception of the military secretary, who is a major-general. There are twenty-five officers of this grade on the active list of the U. S. army at the present time.

Brigandine (Low Lat. *brigans*, 'a light-armed soldier'), a mediæval (15th–16th century) coat of mail composed of light, thin, jointed scales, or a coat of thin, pliant plate armor. The term is also applied to a jacket quilted with iron, worn by archers in the reigns of Elizabeth and James I.

Brigands, organized bands who practise general robbery, making their headquarters in fastnesses in forests or mountains, from which they sally forth to plunder travellers of their property, or sieze and hold them until a ransom is paid for their liberation. Brigandage had its origin in Greece and Italy, and soon spread to France and Germany, the former country being responsible for two famous representatives in Cartouche (1693–1721) and Mandrin (1724–55). Perhaps the most noted brigand in history was Fra Diavolo, who played an important part in the revolution of Naples in 1799, and was received with extraordinary favor at the court of Queen Caroline. Spain, also, has been one of the happy hunting-grounds of the brigand, and in that country, as in Italy, popular sympathy has been frequently extended to the robbers rather than the robbed. Sicilian, Turkish, and Bulgarian brigands are now the chief adepts at the game. A recent case was the seizure of Miss Ellen M. Stone, an American missionary, and Mrs. Tsilka, a Bulgarian nurse, who were captured by Macedonian brigands on Sept. 3, 1901, and kept for six months, when they were released on the payment by the United States of a ransom of 25,000 Turkish pounds. See Sir R. Church's *Chapters in an Adventurous Life in Italy and Greece* (1895).

Brigantes, ancient British tribe who inhabited most of Yorkshire, Lancashire, Durham, Westmoreland, and Cumberland.

Brigantine. See BRIG.

Briggs, CHARLES AUGUSTUS (1841-1913), American theologian, born in New York city, and graduated (1860) at the University of Virginia. He studied theology at the Union Theological Seminary and at the University of Berlin, and was ordained at Elizabeth, N. J., 1870, becoming pastor of the Presbyterian church of Roselle, N. J. He was appointed Davenport professor of Hebrew at Union Theological seminary in 1874, and was transferred to the professorship of Biblical theology at the same institution in 1891, his address at this time on 'The Authority of Holy Scriptures' causing Dr. Briggs's trial for heresy as being contrary to the Presbyterian Confession of Faith. Dr. Briggs was acquitted by the N. Y. presbytery, but the decision was reversed by the General Assembly at Washington, who suspended him in 1893. He took orders in the Protestant Episcopal Church in 1899. Some of his many theological works are *American Presbyterianism* (1885), *Messianic Prophecy* (1886), *The Case against Dr. Briggs* (3 vols., 1893), *The Higher Criticism of the Hexateuch* (1893), and *The Messiah of the Gospels* (1894).

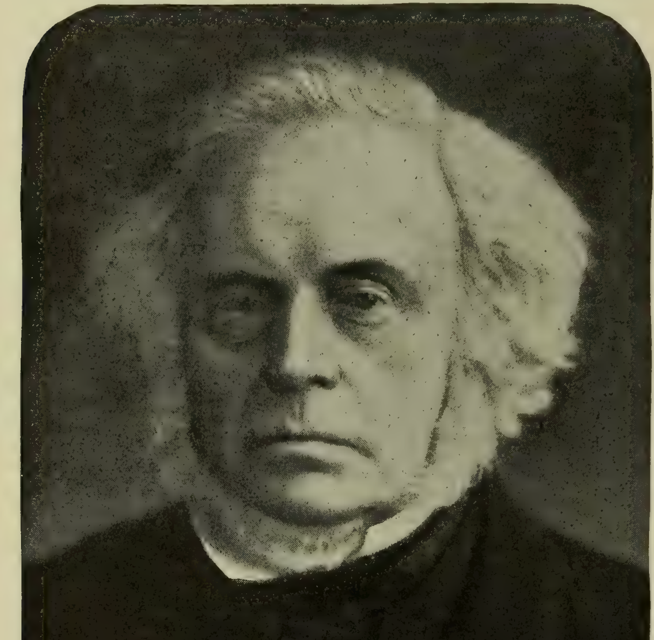
Briggs, CHARLES FREDERICK (1804–77), American author, was born at Nantucket, Mass., and removed to New York early in life where he established the *Broadway Journal*, 1844. Author of *Harry Franco: A Tale of the Great Panic* (1839); *Working a Passage; or, Life on a Liner* (1844); and *Trippings of Tom Pepper* (1847).

Briggs, FRANK OBADIAH (1851), American legislator; born at Concord, N. H.; graduated at the U. S. Military Academy in 1872; served in the army till 1877, then engaged in business in Trenton, N. J. He was mayor of that city, member of the State board of education, and State treasurer; elected U. S. senator (Rep.) for the term 1907-13.

Briggs, HENRY (1561 1630), English mathematician, was professor of geometry at Gresham

College, London (1596–1619), and Savilian professor of astronomy at Oxford, in succession to the founder, Sir Henry Savile. He was among the first to recognize the importance of Napier's discovery of logarithms, and originated the use of the number 10 as the best base for tables. Chief works: *Arithmetica Logarithmica* (1624); *Trigonometrica Britannica* (1633).

Brigham, city, Utah, co. seat of Box Elder co., 52 m. N. by W. of Salt Lake City, near the N. shore of Great Salt Lake, and on the S. Pac. and the Oregon Short Line R. Rs. The city has a public library The chief industries are agricultural. Lumber, leather, worsted and woollen goods, flour and canned goods are manufactured. Pop. (1910) 3,685.



John Bright.
(Photo by Elliot & Fry.)

Brigham, Amariah (1798–1849), American physician, was born at New Marlborough, Mass., was left an orphan, educated himself, and gained considerable reputation as a physician at Greenfield, Mass., before his removal to Hartford, Conn., 1831, where he published brochures in opposition to infant schools and the religious revivals then in vogue. He was superintendent of the Hartford insane asylum, 1840–2, and of a similar institution at Utica, N. Y., from 1842 until his death. His work as a manager of psychopathic establishments was very widely recognized.

Brigham Young College. A coeducational institution of the Mormon Church at Logan, Utah, established in 1877 by a gift of 9,642 acres of land from Brigham Young. The special aim of the college is to make of the students sincere Latter-Day Saints. It offers courses in arts, engineering, agriculture, theology, medicine, music, and domestic arts, with preparatory and high school departments. The attendance in 1905 was 823, with a faculty of 46. The library contained 5,000 volumes and the income was $35,400.

Brighella, a personage in the Italian popular comedy. He is represented as a servant who is always ready to lie, to play tricks, and plot, but leaves the execution of his plots to Arlecchino, another comic character. His livery is white, with green trimmings.

Brighouse, munic. bor., incorporated in 1893 with Brighouse Rastrick and Hove Edge, on the riv. Calder, W. Riding, Yorkshire, England, 4½ m. N.W. of Halifax, It has woollen and cotton factories, flour mills, and flagstone quarries. Pop. (1911) 20,845.

Bright, Sir Charles Tilston (1832–88), English telegraph engineer, was born at Wanstead, in Essex. As engineer of the Magnetic Company (1852–60) he erected lines in various parts of Great Britain, and laid (1853) the first deep-water cable between Portpatrick, Scotland, and Donaghadee, Ireland. His experiments in long-distance electric signalling resulted in the formation, with Brett and Cyrus W. Field, of the Atlantic Cable Company, of which Bright was appointed engineer-in-chief. The first cable (1857–58), after working sixty-eight days, proved a failure. Bright subsequently laid cables in the Mediterranean, the Persian Gulf (1864) and the W. Indies (1871). See *Life* by his brother, E. B. Bright, and his son, Charles Bright (1898).

Bright, Jesse D. (1812–75), American senator, was born at Norwich, Chenango co., N. Y., and was taken as a child to Indiana, where he was admitted to the bar in 1831, practising at Madison in the same state. After filling several important state offices, he was elected U. S. senator from Indiana as a Democrat, 1845, and was twice reëlected, voting in the senate with the Southern Democrats in all matters relating to the abolition of slavery. His second reëlection was unsuccessfully contested, but in 1862, on the evidence of a letter addressed to Jefferson Davis, he was expelled from the Senate by a vote of 32 to 14. He subsequently lived in Carrollton Ky., and in Baltimore.

Bright, John (1811–89), English orator and statesman, the son of Jacob Bright, a Quaker cotton-spinner and manufacturer, was born at Greenbank, near Rochdale, in Lancashire. His friendship with Richard Cobden began over the question of national education; but it was in 1839 that they were drawn closely together, on the formation of the National Anti - Corn - Law League, when Bright began to devote himself heart and soul to the movement for the repeal of the Corn Laws, and from this time forward was the most eloquent advocate of the cause. In 1843 he was returned to the House of Commons for the city of Durham, and speedily made his mark; and at length, in 1846, Sir Robert Peel's measure for repealing the obnoxious laws was carried. Bright incurred considerable unpopularity for his resistance to Lord Ashley's factory legislation, which he opposed on the ground that workmen and employers should be left free to regulate their mutual relations. In 1847 he was returned for Manchester, and again in 1852. He advocated remedial legislation for Ireland, including disestablishment of the church, free trade in land, and a liberal policy towards India.

The Crimean War found a strong opponent in Bright, and some of his finest speeches in Parliament were delivered in connection with this subject—*e. g.* that on Feb. 23, 1855. At the spring election of 1857 he lost his seat for Manchester, owing to his attitude on China and the Crimean War; but in the following August he was returned for Birmingham, and he ever afterward remained one of the representatives of that city.

Brighton from the West Pier.
(*Photo by Frith.*)

Bright supported the bill (1853) carried by Lord Derby's government for the abolition of the E. India Company and the transfer of the government of India to the crown. In 1859–60 he was one of the principal leaders in the great reform agitation; and when the Civil War broke out in the U. S. he ardently supported the cause of the North, though his own trade was most seriously affected by the continuance of the war. The Russell-Gladstone Reform Bill of 1866 he also supported, and when it was defeated by a combination of discontented Liberals ('Adullamites') and the Tories, he took the foremost part in the reform campaign in London, Birmingham, Leeds, Edinburgh, and Glasgow.

When Gladstone came into office in 1868, Bright accepted the presidency of the Board of Trade. He gave powerful support at all stages to the Irish Church Disestablishment Act, the Irish Land Act, and the Elementary Education Act. Resigning office in December, 1870, in consequence of ill-health, he did not appear again in Parliament until April, 1872. He was appointed Chancellor of the Duchy of Lancaster in August, 1873, and held this office until the resignation of the Gladstone ministry in February, 1874. In 1879 he declined an invitation from President Hayes to visit the U. S., where he was held in high honor. When the Liberals returned to office in May, 1880, Bright again became Chancellor of the Duchy of Lancaster, but he retired from the cabinet in 1882, on the ground that he could not support the policy of his colleagues in Egypt—a policy which led to the bombardment of Alexandria. When Gladstone introduced the Home Rule Bill for Ireland in 1886, Bright separated himself with pain from his old leader. From May, 1888, Bright suffered almost continuously from illness until his death in the following March. He was a strong, manly Englishman, fearless but just in his political contests, and with a power of simple, nervous eloquence which placed him in the front rank of parliamentary orators. See Bright's *Life and Speeches*, by G. Barnett Smith (2 vols. 1881); Robertson's *Life* (new ed. 1884); *Speeches* (published in 1868); *Public Letters* (ed. by H. J. Leech, 1895); and John Morley's *Life of Cobden* (Jubilee ed. 1896).

Bright, RICHARD (1789–1858), English physician, was born at Bristol, and received his medical education in Edinburgh and London. In 1820 he settled in London. His *Reports of Medical Cases* (1827), studies in morbid anatomy, contain the first statement of the association of general dropsy and albuminuria with a morbid condition of the kidneys, and the name 'Bright's disease' has been given to non-suppurative nephritis. He was physician-extraordinary to Queen Victoria (1837).

Bright, WILLIAM (1824–1901), canon of Christ Church, Oxford, born at Doncaster; theological tutor in Trinity College, Glenalmond (1850–9), and tutor of University College, Oxford (1859–68), when he was made regius professor of ecclesiastical history at Oxford, and canon of Christ Church. Canon Bright was a voluminous writer, his works including *Ancient Collects and Prayers* (1857), *Hist. of the Church* (1860), *Faith and Life* (1864), *Chapters of Early Eng. Church Hist.* (1878), and *Iona and other Verses* (1895). He also edited Eusebius's *Eccles. Hist.* (1872), St. Athanasius's

Against the Arians (1873) and *Historical Writings* (1878), and St. Augustine's *Anti-Pelagian Treatises* (1880).

Brightly, Frederick Charles (1812–88), American lawyer, was born at Bungay, Suffolk, England, came to the U. S. in 1831, and was admitted to the bar of Philadelphia, 1839. He gained an extensive reputation as a reference lawyer, and was consulted so often upon points of law that he abandoned practice in 1870 and devoted himself to the preparation of digests, of which he published a large number, chiefly concerned with the laws, cases, and decisions of Pennsylvania and its courts.

Brighton, formerly Brighthelmstone, parl. (1832), munic. (1854), co. bor. (1888), and wat.-pl., Sussex, England, on English Channel, 50½ m. s.e. of London. Brighton's great popularity as a fashionable resort arose from the writings of Dr. Russell in the 18th century, the discovery of a chalybeate spring, the residence of George iv., and the facilities afforded to Londoners, especially by the opening in 1841 of railway communication. The corporation has constructed a massive sea front 3 m. long (protected against the sea by a system of groynes), the West Pier (1,115 ft.), and the New Pier (1,700 ft.). The old Chain Pier was washed away in 1896. The Royal Pavilion, acquired in 1850 at a cost of $260,000, is a fine though bizarre structure of Oriental aspect. The Dome, formerly the royal stables, is now an assembly-room accommodating 3,000 people. In connection with this property there are pleasure grounds, a library, a reading-room, an art gallery, and a museum. Among the other fine parks are the Preston (72 ac.), and the Queen's (17 ac.), presented to the corporation by the race-stand trustees. There are well-equipped public baths; and the Aquarium, purchased in 1901, is now converted into a concert hall and winter garden.

The munic. bor. of Hove, or W. Brighton (1,521 ac.; pop., 1911, 42,173), adjoins Brighton, and the par. of Hove forms part of the parl. bor. Preston, to the n., has, since 1873, been included in the munic. and parl. bor. of Brighton.

Brighton has always been connected with the fishing industry, and its boats still bring in large numbers of herring and mackerel. Pop. (1911) of parl. bor. 162,793; munic. bor. 131,250.

Bright's Disease. See Nephritis.

Brigit, Bridget, or Bride, St. (453–523), of Kildare, founded the church of Kildare. Her day is February 1. From the frequent references to fire in her history, it has been suggested that the saint has been partly confounded with Brigit, the old goddess of smiths. See Todd's *St. Patrick* (1844).

Brignoli, Pasquale (1824–84), Italian singer, was born in Naples, Italy, and early devoted himself to music, composing an opera at the age of fifteen. He began the training of his surpassingly fine tenor voice when twenty-one, and sang with success in opera at London and Paris. He was brought to the U. S. by Strakosch in 1855, and made this country his home, gaining a popularity that brought him great wealth, which, however, was scattered as it was received. He sang in grand opera with all the leading sopranos of his time.

Brigue. See Brieg.

Bril, Mattijs (1550–84), Flemish painter, born in Antwerp, went while a youth to Rome, where he executed frescoes at the Vatican for Pope Gregory xiii. His *Jesus Healing the Paralytic* is in the Naples Museum, and his *Virgin and The Infant Jesus and the Two Angels* are in the Dresden Gallery.

Bril, Paulus (1554–1626), the earliest of the great 17th century Flemish landscape painters. He went to Rome with his brother Mattijs, and created a style at once grand, simple, and poetic. Annibale Carracci occasionally painted the figures in his pictures. His works include *Martyrdom of St. Clement* (Vatican), and landscapes in most European galleries. See F. T. Kugler's *Handbook of Painting: German, Flemish, and Dutch Schools* (1879); and Lübke, *History of Art* (1881).

Brill, a European fish closely related to the turbot, from which it is distinguished by its smooth skin, smaller size, and glistening spots.

Brillat-Savarin, Anthelme (1755–1826), French writer and magistrate, born at Belley, is known by his *Physiologie du Goût* (1825; Eng. trans. 1884, as *A Handbook of Gastronomy*), the code of gastronomers, written in a vein of amusing pleasantry. He resided in Switzerland and America (1793–6), and after his return became a member of the Court of Cassation.

Brimstone. See Sulphur.

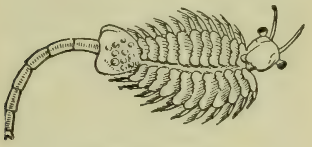
Brin, Benedetto (1833–98), an Italian naval engineer and administrator, was born at Turin, and after service as an engineer in the navy, he was appointed under-secretary of state to the Italian minister of marine in 1873. In 1876 he was promoted to be minister of marine, an office he held with short interruptions down to 1891, and during that time distinguished himself by the rapid manner in which he developed the Italian navy, especially by the construction of the armored cruisers *Dandolo*, 12,265 tons (built 1878, reconstructed 1897), and the *Italia*, 15,654 tons (built 1880), both designed by himself, and the establishment of shipyards and shops for the construction of engines and munitions of war. In 1892 Brin became minister for foreign affairs, but in 1896 returned to his old position as minister of marine.

Brindaban, munic. tn. on the r. bk. of the Jumna, 6 m. n. of Muttra, United Provs., India; one of the holy cities of the Hindus, visited by large numbers of pilgrims. Pop. (1901) 22,717.

Brindisi (anc. *Brundusium*), seapt. tn. and archiepisc. see, prov. Lecce, Italy, the only really good harbor between Venice and the s.e. extremity of Italy, stands on the Adriatic, 472 m. by rail s.e. of Bologna. It acquired renewed importance after the opening of the Suez Canal, as the land terminus of the 'overland' route to India. But in 1898 the Peninsula and Oriental main line steamers made Marseilles their base instead of Brindisi, though a branch line of boats for the mails still runs from the last-named to Port Saïd. Brindisi is also the shipping port for mails to Turkey, Greece, and Albania. The harbor encloses the town with two arms, and is reached by a channel from the outer harbor, which is itself sheltered by some small islands. Vessels of 525 to 550 ft., drawing 25 ft., can now enter and turn without hindrance. The trade aggregates nearly $5,000,000 annually, and is about equally divided between exports (chiefly figs, wine, olive oil, coral, and silk) and imports (mostly coal). This town was an important shipping centre under the Romans, when, being the sea terminus of the Appian Way, it was the chief port for Greece (Dyrrhachium was only 70 m. distant across the Adriatic); and again in the period of the crusades. The town has a cathedral, rebuilt in 1100; a castle, built by the Emperor Frederick ii., and now used as a prison; and a museum, in the ancient 11th-century baptistery of St. John. Here the Roman poet Pacuvius was born, and here the poet Virgil died in 19 b.c. The town was besieged by Cæsar in 49 a.d., was destroyed by King Louis of Hungary in 1348, and suffered from an earthquake in 1458. Pop. (1860) 8,000; (1901) 23,106.

Brindley, James (1716–72), English engineer, planned (1758) a canal from Worsley to Manchester for the Duke of Bridgewater — the commencement of English inland navigation. In all he superintended the construction of more than 365 miles of canal, the most important being the Grand Trunk, between the Trent and the Mersey.

Brine Shrimps (*Artemia*), small crustaceans found in the water of salt lakes, and of interest because the naturalist Schmankewitsch succeeded in transforming one so-called species into another by altering the salinity of the water. For discussions of the significance of the experiment, consult Wallace's *Darwinism.*



Brine shrimp

Brink, Bernard ten (1841–92), German philologist, was born in Amsterdam. He studied at Münster and Bonn, and was professor of modern languages at Marburg (1870–73) and at Strassburg (1873–92). He especially distinguished himself as a student of English literature, his principal books being a history of English literature and studies of Chaucer, Beowulf, and Shakespeare.

Brink, Jan ten (1834–1901), Dutch critic and novelist, was born in Appingedam. After studying theology and literature at Utrecht, he taught for a time (1860) at Batavia, Java, then at The Hague (1862–84), and in 1884 became professor of Dutch literature at Leyden. In the field of criticism he wrote (in Dutch) *History of North Dutch Letters in the Nineteenth Century* (new ed. 1902); *Talks about Modern Novels* (1884); studies of Bulwer-Lytton (1873); Zola (1879), and others. Of his novels it may suffice to mention *Het verloren Kind* (1879); *De Schoonzoon van Mevrouw de Roggeveen* (1872–73); *De Brederos* (1891). His *Literary Sketches* (Dutch) were collected in 17 volumes (1882–8), and his *Novels* in 13 volumes (1885).

Brin'kerhoff, Roeliff (1828–1911), American banker and penologist, was born in Owasco, N. Y. He engaged in teaching until his admission to the bar at Mansfield, O., in 1852. During the Civil War he served in the Union army, and at its conclusion was brevetted brigadier-general. Returning to his law practice in Mansfield, he helped organize the Mansfield Savings Bank, of which institution he eventually became president. He was president of the American National Prison Congress and of the Ohio Archæological and Historical Society (1893–1907), and was an advocate of the cottage plan for asylums, and of other reforms in the administration of public charities and prisons. He wrote *The Volunteer Quartermaster: Recollections of a Lifetime* (1900).

Brinkley, Frank (1844–1912), British editor and authority on Japan, entered the British army and in 1867 went to Japan with the Royal Artillery. In 1871 he became principal instructor in the Marine College at Tokio and later professor of mathematics in the Imperial College of Engineering. In 1881 he founded the *Japan Mail,* of which he was editor and proprietor for thirty years. He prepared a Japanese-English dictionary and wrote *Japan* (1901) and *Japan and China.* He was Tokio correspondent of the London *Times* and was widely known as a student of Japanese history and politics.

Brin'ton, Daniel Garrison (1837–99), American anthropologist, was born in Thornbury, Pa. He was graduated from Yale (1858), studied medicine, travelled abroad, and served as surgeon in the Civil War from 1862 to 1865, when he was brevetted lieutenant-colonel of volunteers. In 1884 he was made professor of ethnology and archæology in the Philadelphia Academy of Natural Sciences, and in 1886 became professor of American linguistics and archæology in the University of Pennsylvania. From 1867 to 1887 he was editor of the *Medical and Surgical Reporter.* Professor Brinton's researches in American archæology placed him among the foremost anthropologists of the world. He published and edited a *Library of American Aboriginal Literature* (8 vols., 1882–90), and wrote *Myths of the New World* (1868); *Religious Sentiment* (1876); *Races and Peoples* (1890); *The American Race* (1891); *Religions of Primitive Peoples* (1897); *The Basis of Social Relations* (1902). Consult American Philosophical Society's *Proceedings* (1900).

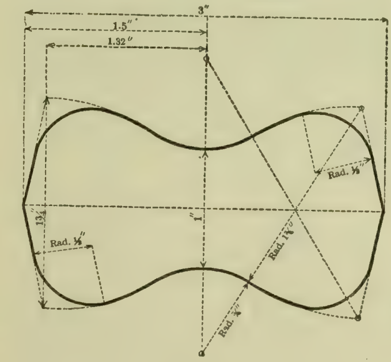


FIG. 1.

Brinvilliers, braṅ-vē-yä′, Marie Madeleine Dreux d'Aubray, Marquise de (*c.* 1630–76), French poisoner, was married to the Marquis de Brinvilliers in 1651. Conceiving a passion for a young officer, Jean Baptiste Sainte-Croix, and having learned from him the secrets of poisoning, she in 1670 poisoned her father, two brothers, and sisters. Her guilt was discovered on the sudden death of Sainte-Croix (1672). She fled, but was arrested in a convent at Liège, and beheaded and burned at Paris (July 16, 1676). Consult Bauplein's *La Marquise de Brinvilliers;* Stokes' *Madame de Brinvilliers and Her Times.*

Brion, Friederike. See Goethe.

Brio'nian Islands, in the Adriatic, opposite the harbor of Pola in Istria. Here are sandstone quarries whence the stone was obtained for building the palaces of Venice, and here the Genoese defeated the Venetians in a naval battle in 1379. The islands, formerly an Austrian possession, now belong to Italy.

Brioude, brē-o͝od′, town, France, department of Haute-Loire, near the River Allier; 30 miles by rail northwest of Le Puy. The church of St. Julien, founded in the fourth century and finished in the twelfth and fourteenth, is a fine example of Auvergnat-Romanesque style. Pop. (1921) 4,754.

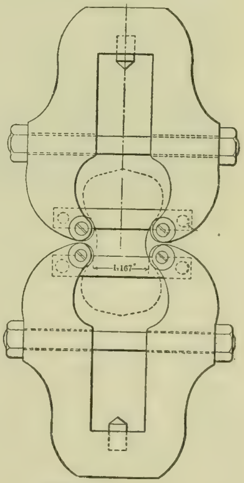


FIG. 2.

Briquette, bri-ket′. (**1.**) A small, press-moulded lump of coal dust, fine ore, or similar material. See Briquetting.

(2.) A small moulded block of hydraulic cement or mortar, of special shape, made for testing the tensile strength of the cement. As all large purchases of cement are subjected to tensile test of frequent samples to verify their meeting the specified strength requirements, the details of the test have much industrial importance, and the shape of the test briquette has therefore been standardized. The American standard briquette form is shown by Fig. 1; the standard clips which engage it, with cement briquette held therein for tensile test, by Fig. 2—both in accordance with the 1912 standards fixed by a committee of the American Society of Civil Engineers. The briquette is uniformly one inch thick, and its breaking load thus expresses directly the tensile strength of the cement in pounds per square inch. Briquettes are moulded in brass moulds, the mortar being pressed in with the fingers and trowelled off. Slightly different briquette shapes and moulding methods are used in Europe. See Cement.

Briquetting, the process of consolidating fine coal, ore dust, or similar matter by pressing in moulds to form small lumps (*briquettes*) for subsequent treatment or utilization. Binding substances, such as pitch, lime, etc., are usually employed. Briquettes vary in size, according to their use, from small egg to half-brick size. The process makes it possible to utilize efficiently fine material which would otherwise be impossible or difficult of utilization. It has been applied extensively to coal, and to some extent to fine iron ores and the flue dust accumulated in smelting iron, copper, and other ores.

Coal briquetting is an important industry in Europe. In America it has found less use because of the comparatively low price of coal and the high price of binders. The principal binders are pitch, tar, asphaltic or other bituminous material; heavy petroleum residue, starch, and sulphite-mill waste liquor. Gas pitch is most commonly used, 6 to 7 per cent. of the coal weight being employed. Anthracite is briquetted to stove sizes; bituminous and lignites to larger sizes—up to 3 or 4 lbs. in weight. Briquetted coal gives a clean, smokeless fire; burns regularly and under good control, and gives little ash. These qualities make it a popular household fuel in Europe, where anthracite is costly.

Ore briquetting has acquired some importance as a means of utilizing the flue dust of furnaces and smelters, slimes, roasted sulphide ores, etc. The principal binders are lime, lime and clay, and a mixture of lime with soda ash and salt. Cylindrical briquettes of 3 to 4 lbs. are convenient. The briquetting is done by rotary or plunger presses. Certain ores may be agglomerated by sintering (baking or partly fusing into small lumps or concretions); and this method has in some instances proved preferable to briquetting.

Brisbane, capital of Queensland, Commonwealth of Australia, is situated on the river of same name, 16 miles from Moreton Bay; 500 miles north of Sydney. It is connected by rail with the interior, and by the main coast line with Rockhampton on the north and the Tweed on the south. It is served by the Canadian-Australian mail steamers, running monthly between Sydney and Vancouver, and by several British lines. The mean temperature is 69°, and the rainfall annually averages 48.36 inches. The University of Queensland, established by law of 1909, was opened here in March, 1911; and the technical colleges of Brisbane, South Brisbane, and West End have been consolidated, and are affiliated with the university. There are over 42 miles of tramway. The water supply is obtained from the upper Brisbane River, and from the Enoggera and Gold Creek reservoirs.

Brisbane is a great trading and manufacturing centre. Wine, bananas, and pineapples are produced; and preserved and frozen meats, hides and skins, wool, tallow, butter, and other pastoral produce are the chief lines of export. The harbor has two main entrances, having at low water depths of 24 and 30 feet respectively. There is a complete system of wharves and docks connecting directly with the railroads.

Brisbane was settled as a penal station in 1825 by Sir T. M. Brisbane, governor of New South Wales. The era of progress began in 1842, when the colony was opened to free settlers. Pop. (1921) 42,629.

South Brisbane lies on the south side of the Brisbane River. It has an important shipping trade, and has a dry dock which will accommodate vessels up to 420 feet in length. Pop. (1921) 37,151.

Brisbane, Arthur (1864–), American journalist, was born in Buffalo, N. Y., received his early education in American public schools, and studied for five years in France and Germany. He began newspaper work in 1883 on the staff of the New York *Sun*, was London correspondent and editor of the *Evening Sun;* for seven years managing editor of different editions of the *World;* and editor of the New York *Evening Journal* (1897–1926). He purchased the Washington *Times in* 1917, the Milwaukee *Evening Wisconsin* in 1918, and the following year sold both papers to William Randolph Hearst.

Brisbane, Sir T. Makdougall (1773–1860), British astronomer and colonial governor, was born near Largs in Ayrshire. He entered the army, served in Flanders, the West Indies, and the Peninsula, and was governor of New South Wales from 1821 to 1825. He founded three observatories: two in Scotland—at Brisbane, near Largs, and at Makerstoun—and one at Parramatta, near Sydney, Australia, where important work was done in cataloguing the stars of the Southern Hemisphere.

Briseis, brī-sē'is, daughter of Briseus of Lyrnessus, was taken captive by Achilles during the Siege of Troy. When Agamemnon had to give up Chryseis to her father Chryses, he took Briseis from Achilles. Hence 'the wrath' of Achilles and the *Iliad.*

Brisson, brē-sôṅ', Eugène Henri (1835–1912), French lawyer and legislator, was born in Bourges, studied law in Paris, and was called to the bar in 1859. He was deputy mayor of Paris (1870); member of the assembly (1871), its vice-president (1879), and president (1881); Prime Minister of France (1885), and an unsuccessful candidate for the Presidency (1895 and 1899). He gained distinction as president of the Panama Commission, and for his unbiased administration, at the time of the Dreyfus case, as president of the Chamber of Deputies (1894–9). He was connected with several newspapers and founded the *Révue politique.* He wrote *Souvenirs: Affaire Dreyfus* (1908).

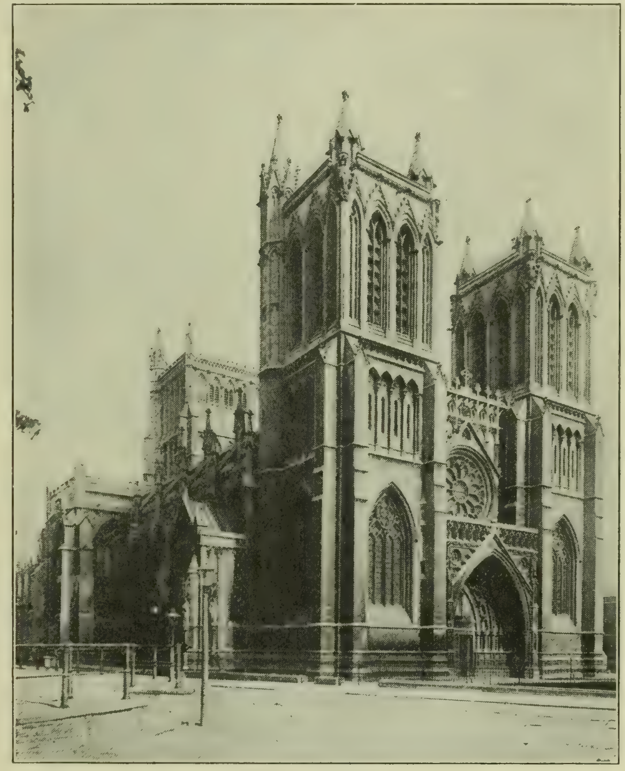
Brissot de Warville, brē'sō' de vär'vēl', Jean (Jacques) Pierre (1754–93), French revolutionist, was born near Chartres. He was trained for the law, but turned to journalism and authorship, and published *Théorie des lois criminelles* (1780) and *Bibliothèque philosophique du législateur* (1782–6). He was imprisoned for four months in the Bastille for publishing the pamphlet *Le diable dans un bénitier* (1784), directed against the ministry. After a journey to the United States to study the problems of slavery and emancipation, he was elected to the National Assembly. He established *Le patriote français,* the Girondist organ, and became the leader of the Girondists, who were at first named Brissotins. Their leader warmly advocated the spread of republican principles in Europe; was in favor of war against Austria and Britain, and had much to do with the downfall of the monarchy. But opposing the trial and condemnation of the king, he incurred the enmity of Robespierre. He was arrested in June, 1793, and in October following perished on the scaffold with twenty of his Girondist friends. He seems to have acted from conviction, though he has been accused of self-seeking. He exercised great influence on the periodical press as well as on the foreign policy of France. His *Memoirs* were edited by his son, in 4 vols. Consult also Carlyle's *French Revolution;* Aulard's *French Revolution* (1910).

Bris'tles, the long, stiff hairs growing on the back and sides of the hog and wild boar. There are black, gray, yellow, silvery, and white bristles, the last named being the most valuable. The best are obtained from pigs inhabiting cold countries, and from lean, wiry animals such as the Russian hog. Bristles are used chiefly in the manufacture of brushes, and constitute a valuable article of commerce, the principal supply coming from Russia, Manchuria, and Germany. They are also obtained from France and Belgium, and from China.

Bris'tol, county, borough, and city, once the second town in England, stands on the River Avon, at the borders of Gloucestershire and Somerset, and on the Great Western and Midland Railways; 118 miles west of London. It has a famous Cathedral, which retains the site and part of the building of an Augustinian monastery founded by Robert Fitzharding, who began the erection of the Abbey in 1142. The present nave and west towers were completed in 1888. The Church of St. Mary Redcliffe is even more beautiful, and there are many other fine old churches. Other important buildings are Colston Hall, Cabot Memorial Tower, the Hospital and Infirmary, the two theatres, the Museum, Art Gallery, Grammar School, Merchant Venturers' schools, Muller's orphanages on Ashley Down, and 70 artisans' dwellings. The University of Bristol, founded in 1909, has faculties of Arts, Theology, Science, Medicine, and Engineering. There are many parks and recreation grounds.

The city is well provided with docks to handle its increasing trade—the city docks, Avonmouth docks (opened by King Edward VII. in 1908), and the Portishead dock have a combined area of nearly 50 acres; the floating dock 85 acres. The railroad station on the south pier provides through transporation facilities. Much trade is carried on in cotton, cocoa, boots, corrugated iron, chemicals, timber, sugar, soap, tobacco, wool, and Irish provisions. The trade in 1921 amounted to £36,231,628 (imports) and £488,335 (exports). Imports from Canada and Jamaica are particularly large. The city limits have been extended since 1901. Pop. (1921) 337,061.

History.—There are plentiful traces of British and Roman occupation about Bristol, and silver pennies were struck here (978–1016) in the reign of Ethelred the Unready. The town was early infamous as a slave market. Yielding easily at the Conquest, it was fortified by Bishop Geoffrey of Coutances, its castle surviving till 1665. Notable events are the insurrection of 1313–14; the Black Death in 1349; the sailing of John Cabot, in 1497, on the voyage that resulted in the discovery of the mainland of North America; two sieges during the Civil War; the 'Bridge' riots of 1793; the opening of docks in 1809; the serious reform riots of 1831; and the sailing of the *Great Western* in 1838. Bristol is the birthplace of Chatterton, Southey, and Hannah More. Consult Harvey's *Bristol,* and Stone's *Bristol* (1909).


Bristol Cathedral

Bristol, city, Connecticut, Hartford county, on the New York, New Haven, and Hartford Railroad; 16 miles southwest of Hartford. It has a public library, foundries and machine shops, and manufactures of clocks, brass goods, and engines. According to the Federal Census of 1919 industrial establishments number 68, with $30,354,716 capital, and products valued at $30,689,970. Bristol became a city in 1911. It has commission government. Pop. (1900) 6,268; (1910) 9,527; (1920) 20,620.

Bristol, borough, Pennsylvania, Bucks county, on the Delaware River, at the terminus of the Delaware and Lehigh Canal, and on the Pennsylvania Railroad; 20 miles northeast of Philadelphia. There is a well known mineral spring here. Industrial establishments include cotton and woollen mills, a foundry, rolling and planing mills, and factories for the manufacture of carpets, patent leather, and stockings. According to the Federal Census of 1919, industrial establishments number 34, with $5,707,503 capital, and products valued at $5,697,607.

Pop. (1900) 7,105; (1910) 9,256; (1920) 10,273.

Bristol, town, Rhode Island, county seat of Bristol county, on Narragansett Bay, and on the New York, New Haven, and Hartford Railroad: 16 miles southeast of Providence. The township occupies a narrow peninsula which is separated by a small bay from Fall River on the east. It has a public library, the Colt Memorial high school, a home for destitute children, and homes for aged men and women. The city has rubber works and woollen mills and a shipyard famous for yacht building. According to the Federal Census for 1919, industrial establishments number 28, with $24,922,005 capital, and products valued at $17,841,557. The peninsula has been suggested as the Vinland (q. v.) of the Norsemen. Mount Hope, on the east side, was the seat of Massasoit and King Philip, the Narragansett chiefs. Bristol was burned by the British in 1778. Pop. (1900) 6,901; (1910) 8,565; (1920) 11,375.

Bristol, town, Tennessee, Sullivan county, and city, Washington county, Virginia, in the eastern part of the former State and the western part of the latter (the boundary running east and west along the main street). It is on the Norfolk and Western, and the Southern Railroads; 100 miles northeast of Knoxville. It is the seat of King (Presb.) and Sullins (M. E. South) Colleges, Virginia Intermont College (Bapt.), and a public school for negroes. The industrial establishments include flour, lumber, and pulp mills, and tobacco, furniture, leather, and ice factories. The town is the centre of the iron ore, timber, and coal deposits of the South. Bristol, Tennessee, has the commission form of government; Bristol, Virginia, the city manager form. Bristol, Virginia, was originally called Goodson. Pop.: Bristol, Tenn. (1910) 7,148; (1920) 8,047; Bristol, Va. (1910) 6,247; (1920) 6,729.

Bristol Bay, an arm of Bering Sea, between the southern headlands of the Yukon Land District and the Alaska Peninsula. Communication with the interior is opened for a considerable distance by Lakes Illiamna and Clark, which empty into the bay.

Bristol Board, a fine pasteboard with a smooth and sometimes glazed surface, originally manufactured in Bristol, England. It is composed of thick, stiff paper, and is used chiefly by artists and draughtsmen.

Bristol Brick. See Bath Brick.

Bristol Channel, an arm of the Atlantic Ocean, on the west coast of England, separating South Wales from Devon and Somerset, and extending from the mouth of the Severn to St. George's Channel (80 miles). It is the largest inlet of Great Britain, having an irregular coast line of 220 miles. It includes the bays of Carmarthen and Swansea and Milford Haven on the north, and Bridgwater, Minehead, Porlock, Ilfracombe, and Barnstaple on the south. It receives the rivers Towy, Taff, Usk, Wye, Severn, Avon, Parret, Tone, Taw, and Torridge. The rapid tides, meeting the waters of the Severn, cause the upheaval known as 'the Bore.'

Bris'tow, city, Oklahoma, Creek county, on the Oklahoma Southwestern, and the St. Louis-San Francisco Railroads; 75 miles northeast of Oklahoma City. Pop. (1910) 1,667; (1920) 3,460.

Bristow, Benjamin Helm (1832–96), American executive, was born in Elkton, Ky. He was graduated (1851) from Jefferson College, Pa.; practised law; served in the Union army through the Civil War, and was U. S. district attorney for the Louisville district (1865–70). He was solicitor-general of the United States (1870–2) and Secretary of the Treasury (1874–6). During this term he conducted prosecutions against the notorious 'Whiskey Ring' (q. v.).

Bristow, Joseph Little (1861–), American legislator, was born in Wolfe county, Ky. He was graduated from Baker University, Kansas, in 1886. He became clerk of the district court of Douglas county (1886–90); was editor and proprietor of newspapers in Salina and Ottawa, Kans.; secretary of the Republican State Committee (1894–8), and fourth assistant postmaster-general (1897–1905). He became prominent by his investigation of alleged postal frauds in Cuba after the Spanish-American War, and later by his investigation of charges of fraud and corruption in the government service. In 1905 he was appointed a Panama Railroad commissioner, and in 1909 was elected U. S. Senator from Kansas for the term ending in 1915. He served as chairman of the public utilities commission, 1915–18, after which he became owner and editor of the Salina *Evening Journal.*

Britain, the ancient name for the British Isles. It is of uncertain origin, but is usually ascribed to a Celtic source, still undetermined. Professor Rhys suggests that it is derived from the Celtic *brethyn*, 'cloth'—the inhabitants being 'cloth clad,' while the Celts wore skins. It is also conjectured that the Phœnicians, who first discovered the islands Albion (England and Scotland) and Ieren (Ireland), named them the land of tin—*Bratannac*—the word gradually becoming softened, through the Greeks and Romans, to Britannicæ and Britannia. The latter term came into use when the Romans occupied the islands, the divisions being *Britannia Romana* and *Britannia Barbara.* Serverus (beginning of third century) divided Britain into two provinces, *Britannia Superior* and *Britannia Inferior.* The term later dropped out of use, to be revived on the union of England and Scotland (1707). See Great Britain; England and Wales; Scotland.

Britan'nia Metal, an alloy consisting of 80 to 90 parts of tin, 8 to 20 of antimony, and sometimes small quantities of copper, zinc, lead, or bismuth. It is harder than tin, takes a good polish, and is capable of being silver-plated. The metal may be cast or worked into vessels of the required shape by pressing and rolling, and articles made of it acquire a metallic ring by heating in oil to the temperature at which the metal fuses. It is used for making spoons and teapots.

Britannia Secunda, the Roman name for Wales.

Britannia Tubular Bridge. See Bridge.

Britan'nicus (42–55 A.D.), son of the Emperor Claudius and Messalina, obtained his name from the victories which his father was held to have won in Britain. After the degradation of his mother, Agrippina, Claudius' second wife, prevailed on Claudius to make her son Nero his heir. She then sought to control her son by threatening to uphold Britannicus as the lawful heir and Nero had him poisoned in 55 A.D.

British Academy. See Academy.

British Association for the Advancement of Science, the chief scientific association in Great Britain. The first meeting was held in York on Sept. 27, 1831. Sir David Brewster was the practical founder of the association, which now numbers about 5,000 members. Annual meetings are held, on invitation, in various towns (London excepted), usually in the United Kingdom, though the association has also met in Montreal, Toronto, Winnipeg, Cape Town, Johannesburg, and Sydney. It is divided into the following sections: *A.* Mathematics and Physics; *B.* Chemistry and Mineralogy; *C.* Geology; *D.* Zoology; *E.* Geography and Ethnology; *F.* Economic Science and Statistics; *G.* Engineering; *H.* Anthropology; *I.* Physiology; *K.* Botany; *L.* Educational

Science; *M.* Agriculture (created 1911). A volume is published in connection with each meeting, giving the reports, addresses, and papers which are submitted to the members. A large income yields a surplus, which is devoted to grants—$5,000 to $10,000 annually—for special researches conducted by committees of the association.

British Astronomical Association, founded in October, 1890, to encourage popular interest in astronomy, to associate and organize amateur observers, and to circulate current astronomical information. The association numbers more than 1,000 members, and has twelve 'observing sections.' There are branches in Glasgow, Sydney, and Melbourne. The association publishes a *Journal* and *Memoirs.*

British Central Africa Protectorate (Nyasaland), territory under British protection in South Central Africa, bounded on the east by Lake Nyasa, on the east, south, and southwest by Portuguese East Africa, on the north by Tanganyika Territory, and on the west by Northern Rhodesia. It is about 520 miles long and 50 to 100 miles wide, and has an area of 39,573 square miles. In physical configuration the Protectorate is a plateau, diversified with mountain ridges, the highest known elevation being the volcanic Mlanje (9,683 feet), south of Lake Chilwa. On the western versant of Lake Nyasa the tableland occasionally reaches 7,000 to 8,000 feet. The most important district of the Protectorate is the Shiré Highlands, consisting of a mountainous country in the southeastern part, with a fertile well-watered soil. The principle rivers are affluents of the Zambezi, the most notable being the Shiré.

In the Shiré valley the climate is fairly cool in winter, but tropical in summer; the rainfall averages 35 inches. In the Shiré Highlands the temperature ranges from 96° to 40°, and the rainfall from 40 to 100 inches. The country is comparatively healthful; but malarial and blackwater fevers occur, parasitic diseases are common, and cases of sleeping sickness have been reported on the southwest shores of Lake Nyasa.

The flora is fairly abundant, and in places becomes tropically luxuriant, with nearly all the characteristic plants and trees of tropical Africa. The fauna includes the antelope, hippopotamus, rhinoceros, elephant, impalla, eland, zebra, lion, leopard, and buffalo. Gold, silver, iron, copper, coal, mica, asbestos and graphite are found, but not in sufficient quantity to be commercially valuable.

Agriculture is the chief occupation, and cotton, tobacco, tea, maize, rice, coffee, rubber, fibre plants, and many varieties of fruit are raised. The lakes and rivers contain good fish, but fishing is mostly carried on by the natives for their own use. There are no manufactures of importance, but there are a few flour mills, tobacco factories, and native industries, such as basket weaving and pottery making.

The Protectorate having no seacoast, trade is carried on by means of the Shiré and Zambezi Rivers. At Chinde (q. v.), at the mouth of the Zambezi, a tract of Portuguese territory is leased by Great Britain, where goods may be transshipped free of duty. The chief articles of export are cotton, coffee, tobacco, chillies, tea, rubber, strophanthus, ivory, maize, beeswax, groundnuts, and oil seeds. The imports are chiefly cottons and other textiles, provisions, and hardware. Exports for 1921 were valued at $2,080,000, imports at $3,185,000. Port Herald and Chiromo are the important ports on the Shiré. The former is connected by the only railroad in the Protectorate (113 miles) with Blantyre in the Shiré Highlands, the chief commercial town and centre of the European planting region. In 1915 an extension of the railroad from Port Herald to Chinde (60 miles) was completed. A highway, metalled from Blantyre to Zomba (44 miles), runs 500 miles north to the northern end of Lake Nyasa. The usual means of transportation is the machilla (hammock); but carts and rickshaws are also common.

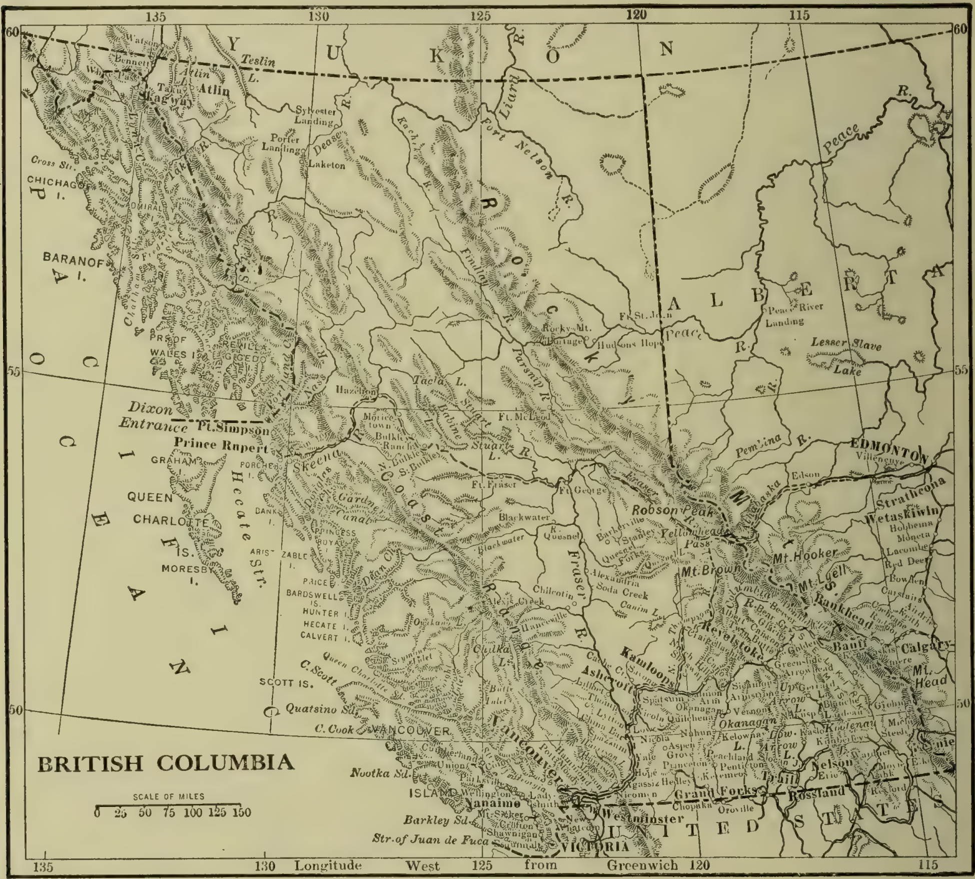
The most important indigenous stock is the Anyasa, and the most important non-indigenous the Yaos. The native languages are Ki-Nyanja and Ki-Yao. Many of the inhabitants are Mohammedans. There are 11 Christian missions and 2,191 schools, with 135 European teachers and 124,000 pupils. The chief towns are Blantyre, Zomba, Port Herald, Fort Johnston and Kota-Kota. Pop. (1921) 1,199,934 natives, 563 Asiatics, and 1,486 Europeans.

Consult Johnston's *British Central Africa;* Colville's *One Thousand Miles in a Machilla; Peace Handbook No. 95* (Great Britain's Foreign Office, 1920).

British Columbia, the most westerly province of the Dominion of Canada, is bounded on the west by the Pacific Ocean and a narrow projection of Alaska; on the north by the 60th parallel; on the east by Alberta; and on the south by the straits of Juan de Fuca and the 49th parallel of north latitude which mark the international boundary between Canada and the United States. Together with the former crown colony of Vancouver Island (area 16,400 square miles), it has an area of 338,263 square miles. The southerly half of the province forms a large and regular rhomboid of elevated land, which is supported on each side by ranges of mountains. On the east are the Rockies and Selkirks, and on the west the Coast and Island ranges, the last partly submerged, Vancouver and Queen Charlotte Islands being the most prominent features. Most of the mainland scenery is wild and picturesque, while the coast line, approximately 4,400 miles, is deeply indented by a succession of extensive fiords and long narrow inlets comparable to the fiords of Norway. The most important rivers are the Columbia or Oregon on the south, debouching through American territory into the Pacific Ocean; the Fraser (750 miles long), the Skeena (300 miles), and the Stikine on the west; the Liard (300 miles in B. C.) on the north, and the Peace (300 miles in B. C.) on the east. These rivers are of great size and volume, and the first four are sufficiently navigable in stretches to be of great service in the development of the country.

The geological formations of the country consist chiefly of the Cambrian, Silurian, Devonian, and Carboniferous groups, with some sections of Cretaceous strata, containing coal, and some Tertiary beds; while the several mountain ranges are the result of violent volcanic upheavals. The highest point is Mount Fairweather, in the Rockies, with a height of 15,287 feet. Mount Robson, on the line of the Grand Trunk Pacific Railway, is 13,068 feet high. The climate varies greatly, being milder in the south than that of regions in the same latitude on the Atlantic coast. The interior plateau, an elevated tract of hilly country, is generally dry and rainless; but the rainfall on certain parts of the coast is often heavy. The average annual precipitation at Victoria is 27.5 inches; at Vancouver 59 inches; and at Prince Rupert 107 inches.

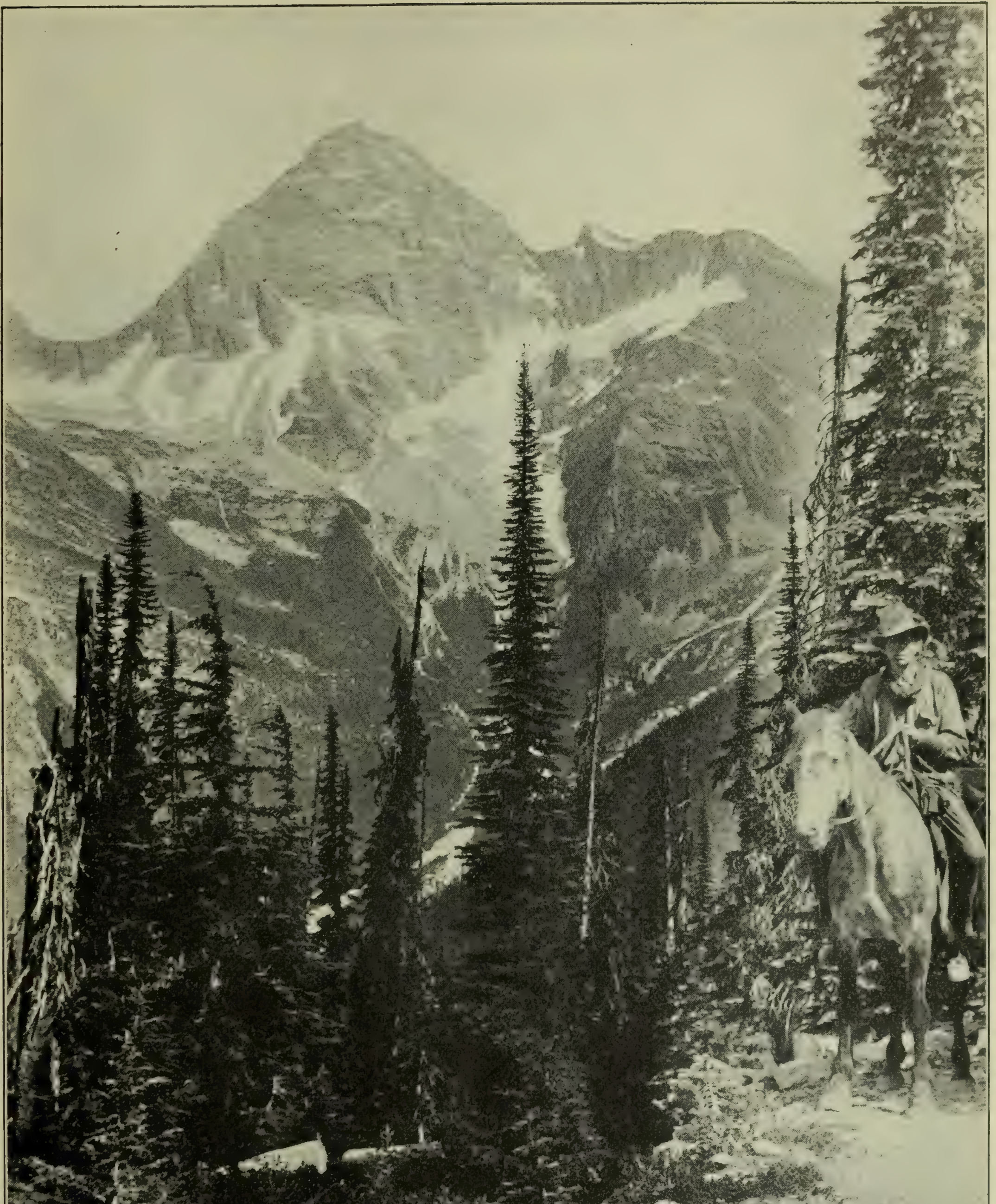
Fauna.—Characteristic of the north country, the fauna includes a large number of wild animals and game. Among the quadrupeds may be named the white, grizzly, and black bear, moose, wapiti, caribou, mule deer, white-tailed and Columbian deer, mountain goat, bighorn or mountain sheep, cougar, wolf, coyote, wildcat, polecat, skunk, black, silver, and cross fox, raccoon, beaver, marten, mink, wolverine, Northern hare, Baird's hare, and muskrat. Marine animals include the sea lion, fur seal, hair seal, and sea otter. The bird life includes the blue and ruffed grouse, ducks, geese, snipe, pheasants, European partridges, quail, prairie chicken, ptarmigan, black brant, teal, mallard, widgeon, merganser, crane, curlew, plover, American magpie, and oriole.



Forests.—A large part of the land is densely wooded, many of the trees—e.g., Douglas pine, Menzies fir, Sitka spruce, giant cedar, red cedar, yellow cypress, white pine, black pine, Engelmann spruce, hemlock, white oak, and broad-leaved maple—being extensively used throughout Canada, besides being exported in large quantities to South America, Africa, and Australia. The wood of the Douglas fir, which sometimes attains a height of 300 feet with a base circumference of thirty to forty feet, is in great demand for shipbuilding. The value of the forest products in 1918 was $54,162,523, of which pulp represented $10,517,250.

Fisheries.—The annual fishery output of British Columbia is 45 per cent. of the total for the Dominion. The fur seal fishery, once important, declined during a period of years in consequence of the indiscriminate killing of seals in Bering Sea, and the disputes that arose with Russia, Japan, and the United States. The Pelagic Sealing Treaty of 1911, between these three countries and Great Britain, prohibited the killing of fur seals at sea, except by Indians or other aborigines along the coast, using canoes, for a term of at least fifteen years, during which period Canada was to receive 15 per cent. gross in number and quality of the seal-skins taken on the United States and Russian seal islands, and 10 per cent of those taken on the Japanese islands. Commercial killing, which was discontinued by both the United States and Russia on their islands for five years following the treaty, was resumed by both countries in 1918. The increase during that period was very satisfactory, and during the season of 1918, there were 34,890 skins taken on the United States islands and 550 on the lesser islands of Japan. In the unsettled condition of Russia it was not possible to ascertain how many seals, if any, were killed on their islands during 1918. By an arrangement entered into with the United States for the disposal of Canada's share of skins, the U. S. government conveys to market all the skins taken from the islands. They are dressed and dyed and then sold at public auction, the United States accounting to Canada for 15 per cent. of the net proceeds. This plan has proved eminently satisfactory to the Dominion.

The principal fish obtained are the salmon, which includes the varieties known as sockeye, quinnat, humpback or pink, chum or dog salmon; trout, shad



Courtesy of the Canadian Pacific

BRITISH COLUMBIA

Mt. Sir Donald (10,808 feet) in the Selkirk Range of the Canadian Rockies.

halibut, flounder, sturgeon, cod, bass, oolachan, and candle fish, anchovy, and smelt. Trolling for salmon as a commercial pursuit is steadily increasing. There are numerous hatcheries in the province for the propagation of fry. The factories in which salmon, cod, and other fish are canned show a steady annual increase in business. There are four whaling stations on the British Columbia coast. The average catch is about 500 whales, which bring in an estimated revenue of $500,000 annually to the province. The value of the fishery products of British Columbia for the year 1920 was $22,329,161.

Mining.—Based upon yearly production, mining is by far the most important industry although the mineral resources of the country have been only partially developed. Among the minerals known to occur in immense quantities are gold, silver, lead, iron, copper, zinc, and coal. During recent years, British Columbia's proportion of mineral wealth has risen to more than 20 per cent. of the total production of the Dominion. The value of the mine products in 1921 was $28,066,641, a decrease of 21 per cent. from that of the previous year, due to a decline both in the quantity and value of silver, copper, and zinc production.

The production of coal for the year 1921 amounted to 2,483,995 long tons, valued at $12,419,975; coke, 59,434 long tons, valued at $416,038. The Nanaimo and Comox coal fields are the most important in the province. Next in rank are the collieries of the Cassian district, East and West Kootenay boundary, Yale, Cariboo, and Lillooet.

Copper is the principal metal produced in British Columbia. The production for 1921 amounted to 39,036,993 pounds valued at $4,879,624. The value of the gold produced from lode mining in 1921 was $2,804,154; from placer mining $233,000. In the same year, 41,402,288 pounds of lead were mined, valued at $1,693,354, and 49,419,372 pounds of zinc, valued at $1,952,065. The silver output was 2,673,389 ounces, valued at $1,591,201, the Slocan district being the largest producer.

Manufactures.—The manufacturing industries of British Columbia are the third most important in the Dominion. According to the Census of Manufactures for 1919 the number of industrial establishments that year was 2,064 (651 in 1910); capital $268,319,281 ($123,027,521 in 1910); employees 49,671 (33,312 in 1910); salaries and wages $60,794,272 ($17,240,679 in 1910); gross value of products $239,794,988 ($65,204,236 in 1910). Lumber is the chief product, although the paper industry is making rapid strides. Four companies in 1919 produced 112,206 tons of newsprint, 8,277 tons of wrapping paper, 78,242 tons of pulp, and 91,145 tons of ground work. The principal markets are the U. S. Pacific Coast cities, Japan, Australia, and New Zealand.

Shipbuilding is one of the important industries of the province. The output of British Columbia's steel and wooden shipbuilding yards for 1919 totalled ten steel ships and forty-six wooden vessels, aggregating 170,500 tons. The majority of steel ships are built for the Dominion Government, the wooden vessels being constructed for French, Norwegian and Greek interests.

Agriculture.—British Columbia is steadily advancing as an agricultural province. The rich valleys and lowlands in the interior offer favorable facilities for fruit growing and dairying. Of these the Okanagan Valley contains the largest area of fruit lands in the province. Apples of excellent quality are exported in large quantities to Eastern Canada and England, and peaches, nectarines, apricots, and grapes are successfully cultivated. Agricultural products in 1921 were 1,178,700 bushels of wheat, 2,756,000 bushels of oats, 307,000 bushels of barley, and 126,000 bushels of rye. Hay and clover to the value of $7,478,000 and alfalfa, $1,121,000, were produced the same year. The province also has extensive fruit regions. The value of all fruits produced in 1921 was $165,791.58, one third (33.14 per cent.) of the value of all fruits produced by Canada in that year. The cheese and butter output for 1921 was valued at $1,307,950. The number of livestock in 1921 was 1,911,927.

Railroads.—The total railway mileage in operation in the province in 1918 was 4,152, as follows: Canadian Pacific 1,812, Grand Trunk Pacific 703, Canadian National 525, Great Northern and controlled lines 420, Pacific Great Eastern 180, British Columbia Electric 281, Esquimalt and Nanaimo 198, White Pass and Yukon 33.

Education.—In 1921 the total enrollment in the high and public schools of the province was 85,950, the number of teachers employed being 2,557. An Act was passed by the provincial government in 1908 providing for the establishment of the University of British Columbia. Its control is vested in the Chancellor Board of Governors and Senate. The total number of students enrolled in 1920–21 was 1,159. Permanent university buildings have been erected on Point Grey peninsula, five miles from Vancouver.

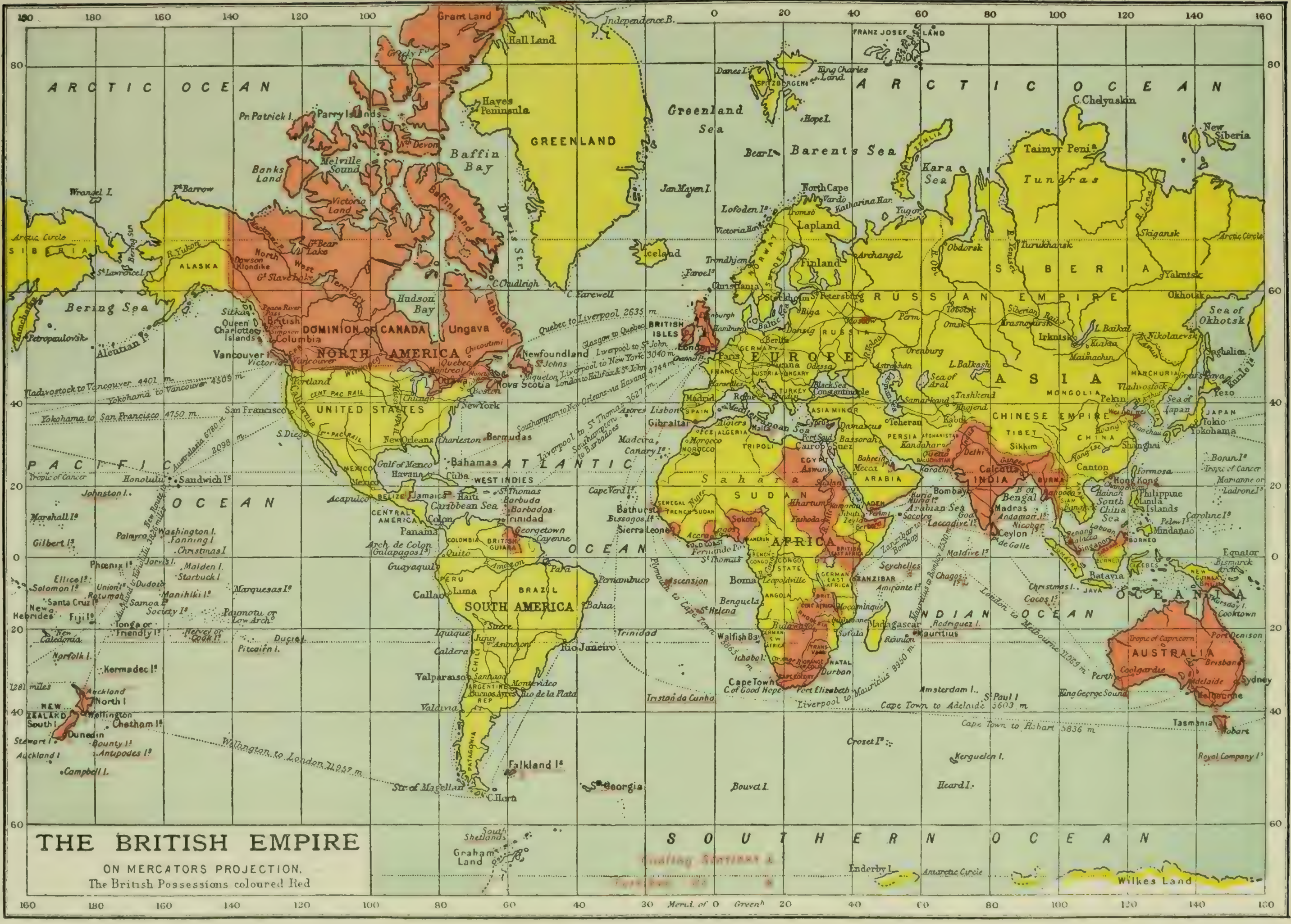
Government and Finance.—British Columbia is administered by a lieutenant-governor, with executive council, and a legislative assembly of 47 members. The province is represented in the Dominion Senate by six members and in the House of Commons by thirteen members. The net revenue for the fiscal year ending March 31, 1920, was $13,861,603; net expenditure $11,568,003; surplus $2,293,600; the excess of assets over liabilities was $2,059,788.

Population.—The population in 1921 was 524,582, an increase of 33 per cent over that of 1911. The chief cities are Victoria, the capital, at the southern end of Vancouver Island (pop. 38,727); Vancouver (pop. 117,217); New Westminister, the former capital (pop. 14,495); and Nanaimo with suburbs (pop. 9,088). In the interior several towns are flourishing, notably Kamloops (pop. 4,501); Fernie (pop. 4,343); Nelson (pop. 5,230); and Trail (pop. 3,020). Prince Rupert (pop. 6,393), the western terminal of the Grand Trunk Pacific, is experiencing steady development.

History.—The first authenticated visits to the country were made by Bodega and Heceta in 1775, and by Captain Cook three years later. In 1782 Captain Meares, an English sailor in the service of Portugal, established a fur-trading station at Nootka, which was soon afterwards plundered by the Spaniards. After Capt. George Vancouver had surveyed the coast, Spain concluded a treaty with England, ceding Nootka and paying an indemnity. In 1918 a treaty was made between England and the United States defining the limits of the two territories; and the Alaska Boundary Commission definitely settled the frontier with Alaska in 1903. Vancouver Island was proclaimed a British colony in 1849, and the mainland received the name of British Columbia by imperial edict in 1858. In 1866 the two colonies were constituted a single province, and in 1871 British Columbia became a province of the Dominion of Canada.

Bibliography.—Consult official publications of the Province; *Reports* of the Department of Mines, Ottawa; R. E. Gosnell's *Year Book of British Columbia* (Coronation Edition, 1911); Ernest Heaton's *Handbook* (Toronto); Begg's *History of British Columbia.*

British East Africa, the largest political division of East



THE BRITISH EMPIRE

ON MERCATORS PROJECTION.

The British Possessions coloured Red

Equatorial Africa consists of a large area on the mainland and the islands of Zanzibar and Pemba. It extends from some 400 miles of coast on the Indian Ocean to the Belgian Congo and the western watershed of the basin of the Upper Nile on the west. The southern boundary runs from Umba in a northwesterly direction to the intersection of the Victoria Nyanza with the first parallel of north latitude, skirts the northern shore of the lake, and thence strikes west to the boundary of the Belgian Congo. The northern boundary begins at the mouth of the Juba River, which it follows to the intersection of the stream with the sixth parallel of north latitude, then runs to the 35th meridian east longitude, and follows that to its intersection with the Blue Nile (Anglo-German agreements, 1886 and 1890). In 1905 British East Africa was taken over from the Foreign Office by the Colonial Office. In 1920 the Kenya Colony became a 'Crown Colony.'

British East Africa consists of Kenya Colony and Protectorate, formerly known as East Africa Protectorate, the Uganda Protectorate (qq.v.), and the island of Zanzibar, with a combined area of about 323,500 square miles. Consult Playne and Gale's *British East Africa* (1910); Ward and Milligan's *Handbook of British East Africa* (1912).

British Empire, the complex association of political communities united under a common allegiance to the British Crown, comprising Great Britain and North Ireland, the self-governing Dominions, India, the Colonies, Protectorates, and Dependencies. Territories administered under mandate of the League of Nations are also usually included.

British Empire: Area and Population.

	Square Miles.	Population.
British Isles	121,633	47,307,601
Gibraltar	2	17,690
Malta	118	225,000
EUROPE	121,753	47,550,291
Canada	3,729,665	8,772,000
Newfoundland	42,734	263,683
Labrador	120,000	3,647
British Honduras	8,592	45,317
British Guiana	89,480	297,691
Bermuda	19	21,987
Bahamas	4,404	53,031
Jamaica and Dependencies	4,520	861,921
Barbados	166	198,363
Windward Islands	526	162,254
Leeward Islands	715	127,193
Trinidad and Tobago	1,977	391,279
Falkland Islands	6,500	3,255
AMERICA	4,009,298	11,201,621
Australian Commonwealth	2,974,581	5,436,794
Papua	90,540	251,339
New Guinea (mandate)	86,000	350,000
New Zealand and Dependencies	103,578	1,232,122
Samoa (mandate)	1,260	37,051
Nauru (mandate)	12	1,985
Fiji	7,435	162,604
Tonga Islands	385	23,562
Solomon Islands (mandate)	11,000	150,750
Gilbert and Ellice Islands	148	31,241
AUSTRALASIA AND PACIFIC	3,274,939	7,677,448
Ascension	34	250
St. Helena	47	3,747
Nigeria	363,000	16,650,000
Gold Coast with Ashanti and Protectorate	80,235	2,029,750
Sierra Leone	31,000	1,404,000
Gambia	4,134	240,000
Somaliland	68,000	300,000
Seychelles and Dependencies	156	24,523
Kenya	245,060	2,630,000
Tanganyika (mandate)	365,000	4,000,000
Uganda	110,300	3,071,608
Zanzibar	1,020	196,733
Nyasaland	39,573	1,201,519
Union of South Africa with Mandated Territory of S. W. Africa	795,489	7,160,136
Rhodesia, North	291,000	931,500
Rhodesia, South	149,000	803,500
Swaziland	6,678	133,563
Basutoland	11,716	500,544
Tristan da Cunha	45	105
Bechuanaland	275,000	152,983
Anglo-Egyptian Sudan	1,014,400	3,400,000
Mauritius and Dependencies	809	377,083
AFRICA	3,851,696	45,211,544
Cyprus	3,584	310,709
Aden and Dependency	4,280	156,500
Palestine (mandate)	9,000	770,000
Iraq (mandate)	143,250	2,849,282
Sokotra	1,382	12,000
Ceylon	25,481	4,504,283
Indian Empire	1,802,629	319,075,132
Straits Settlements	1,609	883,769
Federated Malay States	27,506	1,324,890
Other Malay States	23,486	1,123,264
Borneo, etc.	77,000	851,000
Hong Kong	391	625,166
ASIA	2,119,598	332,485,995
TOTAL	13,377,284	444,126,899

The total area of the British Empire, including mandated territories, is 13,377,284 square miles. Of this, approximately 30 per cent. is in North and South America and adjacent waters; 24 per cent. in Australasia and the Pacific; 29 per cent. in Africa; 16 per cent. in Asia and only 1 per cent. in Europe.

Historical.—The earliest efforts to establish colonies took place along the shores of North America. The first of these was made by Sir Humphrey Gilbert in Newfoundland, in 1583, followed shortly by a small English settlement on the coast of Virginia.

The greater part of the British Empire has, however, accrued in comparatively recent times. During the 17th century the North American colonies were established along the Atlantic seaboard and the Dutch were driven from New Amsterdam. William Penn secured the grant of Pennsylvania in 1681, and by the middle of the 18th century the British colonial possessions stretched from New England to Georgia. These colonies, breaking away in the Revolution of 1776, led to the foundation of the United States of America. In addition to the New England Colonies, the Treaty of Utrecht (1713), terminating the War of the Spanish Succession, left Great Britain in possession of Newfoundland, New Brunswick, Nova Scotia, St. Helena, two trade stations at Gambia and the Gold Coast, the Bermudas, Jamaica, Barbados, the Bahamas, St. Kitts, Nevis, Antigua, Montserrat, the Virgin Islands, and Gibraltar.

Little progress in territorial acquisition took place until the great wars which marked the second half of the 18th century. By the Treaty of Paris (1763), which concluded the Seven Years' War, the remainder of

Canada and Dominica, St. Vincent, Granada, the Grenadines, and Tobago were added to the Empire. In 1788, the beginnings of the Colony of Sierra Leone, in Africa, were established. In 1802, under the Treaty of Amiens, Ceylon and Trinidad were acquired from the Dutch. In 1814 and 1815, the two Treaties of Paris, closing the Napoleonic Wars, ceded the Cape of Good Hope, British Guiana, Malta, Mauritius, Seychelles, St. Lucia, and Tobago, the last having been given back to France in 1783. The supremacy of British interests in India and the Pacific was also recognized.

Towards the end of the 19th century, Natal, Rhodesia, Bechuanaland, Basutoland and the Transkei and Zululand. all in Africa, were occupied. British Columbia and the North West Territories were added to Canada. Australia, New Zealand, British New Guinea, and North Borneo were occupied. By cession, Hong Kong, Labuan, Lagos, and the greater part of the Gold Coast and the Fiji Islands were secured, and the Island of Cyprus and the basin of the lower Niger were acquired by arrangement with the other powers. In 1890, by agreement with Germany, France, and Portugal, the possessions and spheres of interest of those powers in the African continent were limited, resulting in large additions to the Empire. In consequence, British jurisdiction has been established over the territories now known as Kenya, Zanzibar, Uganda, Nyasaland, British Somaliland, the Protectorate of Nigeria, the Northern Territories of the Gold Coast, and the Protectorate of Sierra Leone. Amatongaland came under a Protectorate in 1895 and is now part of Natal. Wei-hai-wei and an extension of British Kowloon were obtained on lease from China in 1898. In 1899, certain of the Solomon Islands in the Pacific were transferred by Germany to Great Britain. After the Boer War in 1900, the South African Republics were annexed to the Empire, paving the way to the union of the chief British colonies in South Africa. The same year, in the West Pacific, Tonga, the Cook Islands, the Savage Islands, and a number of other smaller islands were annexed. The Malay Peninsula, except that part belonging to Siam, is now also under the British Crown, partly as protectorate and partly as crown colony.

During the World War (1914–18), Great Britain and the dominions undertook the seizure of many of the German colonies. The first to fall was Togoland, which surrendered to British and French troops in 1914. German New Guinea, the Bismarck Archipelago, the Solomon Islands, and Nauru were occupied by the Australian forces, and German Samoa by New Zealand forces in the same year. German South West Africa was occupied by the Union of South Africa. In 1915 British, French, and Belgian forces captured the German protectorate of the Kamerun, after operations lasting nearly eighteen months. German East Africa was the most difficult of the German colonies to reduce, the German leader surrendering to British, Belgian, and Portuguese troops only when the war ended. Kiaochau was taken by Japanese and British forces in 1914. Under the Treaty of Versailles, the principle of international mandates was established to deal with these colonies, most of which were placed under the control of Great Britain and the dominions.

Government.—The British Constitution does not lend itself to definition. It is, in the first place, unwritten, and secondly it is liable to constant development. Under it the power of legislation is supreme, so that the Constitution itself may be amended by ordinary Act of Parliament. There are three parties to legislation, namely the King and two Houses of Parliament, though if the upper house reject a money bill, legislation may be effected by the King and the House of Commons alone.

These characteristics appear in differing forms in the constitutions of the dominions, but it is the Crown which is the constitutional element that persists throughout the Empire, and all British subjects share a common citizenship by virtue of their allegiance to it.

In addition to the Crown there are other constitutional links between Great Britain and the rest of the Empire. There is the right of appeal to the Privy Council, a right which, however, is circumscribed within narrow limits. There are also spheres of action in which some legislatures are subordinated to the Crown or to the British Parliament, including provisions which aim at reconciling the conflict of laws.

The constitutional development of the Empire as a whole can best be indicated by classifying its component units in nine political groups.

In the first group is Great Britain, the home and centre of the British Constitution, which is the model, both in form and tradition, upon which all advanced political institutions within the Empire have been, or are being, fashioned. (Northern Ireland possesses local self-government, but is also represented in the Parliament of Great Britain, and is included here.)

In the second group are the self-governing dominions, *viz*, Canada, Australia, South Africa, New Zealand, and the Irish Free State. These possess the fullest rights of self-government within the Empire, under constitutions closely following the British Constitution in fundamentals. At the Imperial Conference of 1926 they were declared to be equal in status and in no way subordinate to one another or to Great Britain in any aspect of their domestic or external affairs.

Thirdly, comes India, which though a member of the League of Nations, is not wholly self-governing. It is in itself an empire, composed of (1) provinces under a complex form of constitution which divides the functions of government between responsible and representative institutions and an executive appointed by the Crown; (2) districts governed without representative institutions; (3) quasi-independent states, governed by native princes, the whole united by allegiance to the Crown and subject to its control in such matters as defence and external affairs.

Newfoundland constitutes a fourth group, its position being midway between that of the dominions and the Colonies in the fifth group. Though in many respects of full dominion status, Newfoundland does not enjoy separate representation in the League of Nations and does not exercise independence in foreign affairs.

Malta and Southern Rhodesia make up the fifth group; they have responsible government in internal affairs, but are subject to certain constitutional limitations.

The sixth group consists of Colonies with local legislatures in which the Executive is appointed by the Crown and is not responsible to the country, and in which (*a*) one House is wholly elected and the other nominated by the Crown, namely, the Bahama Islands, Barbados, and Bermuda, (*b*) there is one House only, partly elected, partly nominated, with a majority of elected members, *viz.* British Guiana, Ceylon, Cyprus, (*c*) there is one House only, partly elected, partly nominated, in which the elected members are a minority, *viz.* Fiji, Granada, Jamaica, Kenya, the Leeward Islands, Mauritius, Nigeria, St. Lucia, St. Vincent, Sierra Leone, the Straits Settlements and Trinidad, (*d*) the House is wholly nominated, (1) with unofficial majority, as in British Honduras and (2) with official majority, as in Falkland Islands, Gambia, Gold Coast, Hong Kong, Northern Rhodesia, Nyasaland, Seychelles, Uganda, The seventh group is composed of colonies and protectorates governed directly or indirectly by the Crown, without representative institutions in the European sense, but with native advisory councils in some cases. These are Ashanti, Basutoland, Bechuanaland Protectorate, Gibraltar, Northern Territories of the Gold Coast, St. Helena and Ascension, Somaliland, Swaziland, Wei-hai-wei, islands included under the Western Pacific High Commissioner, British North Borneo (by chartered company). There are also islands and territories which are governed directly by the great self-governing dominions, *e.g.*, Papua, a territory under the Commonwealth of Australia. This and the preceding group are often called 'Crown Colonies.'

Eighth is the Sudan, which is under British administration without representative institutions, and whose political status is the subject of a condominium agreement with Egypt (1899).

Ninth, and last, there are the territories administered or protected by virtue of International Mandates, *viz.*, mandatory Great Britain: Palestine, Trans-jordania, Irak (now an independent kingdom), Kamerun, Tanganyika, Togoland; mandatory Union of South Africa; South West Africa; mandatory New Zealand: Samoa; mandatory Australia: former German Pacific Islands South of Equator; mandatory the British Empire (joint arrangement between Great Britain, Australia, and New Zealand): Nauru. These for the most part are still without advanced political institutions.

The Imperial Conference.—The Imperial Conference was constituted under a resolution of the Colonial Conference in 1907, for the purpose of discussing questions of common interest as between the British Government and the governments of the self-governing dominions. It is purely advisory and consultative in character. Its resolutions can be made effective only by legislation of the several legislatures represented.

The first officially styled Imperial Conference was held in May and June, 1911, composed of the Prime Minister of Great Britain, presiding, and the Prime Ministers of the dominions. At the proposal of the British Government it was agreed that in future the dominions should be given the opportunity to confer on the instructions given to British delegates to The Hague Conference, that conventions affecting the dominions, provisionally agreed to at that Conference, should be circulated to the dominion governments before they were signed, and that similar procedure should be used in connection with other international agreements affecting the dominions. It was also agreed that liberty should be secured for the dominions to withdraw from treaty obligations under the 'most favored nation' clause. An agreement was reached on the main principles on which naturalization in one of the dominions should be recognized in other parts of the Empire. The development of cable communications and British immigration to the dominions was also furthered, and steps were taken to secure uniformity in the development of the resources of the Empire and in securing uniformity of laws and procedure with regard to shipping. The principle was also laid down that, while it was an undoubted right of the self-governing dominions to determine in what manner their communities should be composed and, therefore, to restrict immigration as they thought fit, this should be done in a way compatible with the comity due to the other peoples of the Empire.

Owing to the War the Imperial Conference could not meet in May, 1915, as had been planned. The War period, however, saw the creation of the Imperial War Cabinet, a system under which overseas representatives became temporary members of the British War Cabinet.

In 1917, the Imperial War Conference took place and devoted its attention to the question of preparedness and the development of the resources of the Empire. It established the Imperial Mineral Resources Bureau and dealt with the difficulties arising from double income taxation within the Empire. It was also agreed that India should be fully represented at future Imperial Conferences.

During the Peace Conference at Paris, in 1919, co-ordination of British imperial interests was secured through a delegation representing the whole Empire. Representatives of the dominions signed the Treaty of Versailles and became original members of the League of Nations. Important treaties arising out of the Peace Settlement were also signed by representatives of the great dominions.

From 1919 to 1925 subsidiary conferences were held as follows: Imperial Statistical Conference, Imperial Entomological Conference, Imperial Forestry Conference, Imperial Customs Conference, and a Conference on Patent Laws of the Empire. The Imperial Shipping Committee was appointed in 1920 to deal with bills of lading and various shipping problems.

In 1921, a conference of Prime Ministers and representatives was held in London, the proceedings of which related chiefly to the foreign policy of the Empire, though major imperial questions, such as communications and Empire settlement, were discussed. The Conference also expressed the opinion that, in the interests of the solidarity of the British Empire, the rights of Indians, already domiciled in other parts of the Empire, should be recognized.

The next regular Imperial Conference took place in 1923. Questions of foreign affairs and defence were discussed; the position of British Indians in the Empire was also dealt with, and it was agreed, by all except South Africa, to give effect to the principle laid down in 1911. Concurrently with the regular Imperial Conference of 1923, an Imperial Economic Conference took place, at which the Irish Free State was represented for the first time. Among the most important matters discussed was the offer of the United States Government to take part in the International Enquiry on the European Reparation Problem which led, in due course, to the Dawes Report.

The next regular meeting of the Imperial Conference was held in October, 1926, when, in addition to the usual main questions, the whole problem of the relations between Great Britain and the dominions, as well as the conduct of foreign relations, was discussed. The result of this Conference was to define a situation, the existence of which had in fact been long recognized. Of the Empire it was declared, 'free institutions are its life blood, free co-operation is its instrument.' No attempt was made to lay down a constitution for the Empire, but it was declared that the dominions were autonomous communities within the British Empire, with absolute equality of status, though united by common allegiance to the Crown and freely associated as members of the British commonwealth of nations. The Conference recognized the peculiar position of India as defined by the Government of India Act. It recommended that the title of the King should be changed to 'George v., by the Grace of God, of the United Kingdom of Great Britain, Ireland, and the British Dominions Beyond the Seas, King, Defender of the Faith, Emperor of India.' It defined the Governor-General of a dominion as the representative of the King and not of the British Cabinet. It advised the establishment of an expert committee to deal with the operation of dominion legislation. With regard to foreign relations, a subcommittee reported on the procedure with regard to the negotiation, form, and signature of treaties, and the powers to be given to plenipotentiaries. It also advised on such questions as the representation of dominions at international conferences and the position of the foreign consuls in the dominions.

In the general conduct of foreign policy it was recognized that the major share of responsibility rests now and must for some time continue to rest with the Government of Great Britain. At the same time, it was declared, neither Great Britain nor the dominions can be committed to the acceptance of active obligations, except with the definite consent of their own governments. The Conference anticipated the most fruitful results from the co-operation of the recently appointed representatives of Canada and the Irish Free State to the United States. It was recognized that where no dominion ministers had been accredited in foreign states, existing diplomatic channels should continue to be used. An Interimperial Committee, it was declared, should be developed to assist personal contact to supplement existing channels of intercommunication on a plan to be worked out. It was also understood that none of the governments represented would take action accepting compulsory jurisdiction of the World Court without further discussion. Finally, the policy inaugurated by the Treaty of Locarno received complete approval from the dominions and India, and the British Government was congratulated on its success.

Defence.—The troops of the self-governing dominions have gradually taken over from Great Britain the work of local defence. Certain of the colonies, such as Gibraltar, Malta, the Straits Settlements and Hong Kong, still have British garrisons. The defence of the Empire, however, rests primarily on the British navy, with substantial assistance from the self-governing dominions. The chief naval stations of the Empire are Simon's Town (South Africa), Bermuda, Malta, Gibraltar, and Hong Kong. A naval base is also in course of construction at Singapore.

The question of defence has always occupied much attention at the Imperial Conferences and at special conferences of dominion representatives. Thus, prior to the Imperial Conference of 1911 there had been a special Defence Conference in 1909, the main results of which were contributions to the British navy by New Zealand, Australia, and Canada, and a provision for a plan for organization of the forces of the Crown, wherever they might be.

See articles on the countries comprising the Empire, *e.g.*, ENGLAND AND WALES, SCOTLAND, IRELAND, CANADA, AUSTRALIA, INDIA, etc. Consult Seeley's *Expansion of England;* Keith's *Constitution Administration and Laws of the Empire;* Anson's *Law and Custom of the Constitution;* Lewin's *Resources of the Empire and their Development; Oxford Survey of the British Empire; the Dominions Office and Colonial Office List; Annual Reports* of the British Colonial Office; *Reports* of Imperial Conferences.

British Empire Exposition, an exposition held at Wembley, just outside of London, in April–October, 1924, its primary purpose being to furnish to British subjects in particular, and to the world in general, an idea of the economic resources of the British Empire in raw materials and manufactures, to open up new markets for both dominion and world trade, and to stimulate trade within the Empire. The exposition grounds covered an area of nearly 240 acres; the great main buildings included the Royal Pavilion, the Stadium, Palace of Engineering, Palace of Industry, Palace of Art, and the pavilions of the different colonies. The Royal Pavilion, symbolizing the power and dignity of the British Government as the centre of the Empire, housed exhibits illustrating the functions of the Home Government. The post office, mint, ordnance survey, and other branches of government were represented, and there was a theatre with its stage in the form of a water tank for the presentation of historic naval spectacles. The Stadium covered an area of 10 acres and accommodated over 125,000 people. The Palace of Engineering, said to be the largest concrete building in the world, contained a fine display of engineering products, over 300 British firms having contributed toward the collection. The exhibits comprised shipbuilding, marine, mechanical, and general engineering products; a giant electrical power station was open to public inspection, and all British makes of motor cars and sea transport stock were displayed. The Palace of Industry was devoted to the display of British industry other than that connected with engineering. The chemical industry had the largest single exhibit, cotton and woollen textiles being next in importance. The Palace of Art housed a notable collection of pictures and sculpture; a lofty basilica exemplified ecclesiastical art, and two galleries were devoted to the art of the theatre. The beautiful pavilions erected by the Indian Dominion and Colonial Governments contained magnificent exhibitions of the Empire's wealth of raw materials and the development of colonial industry.

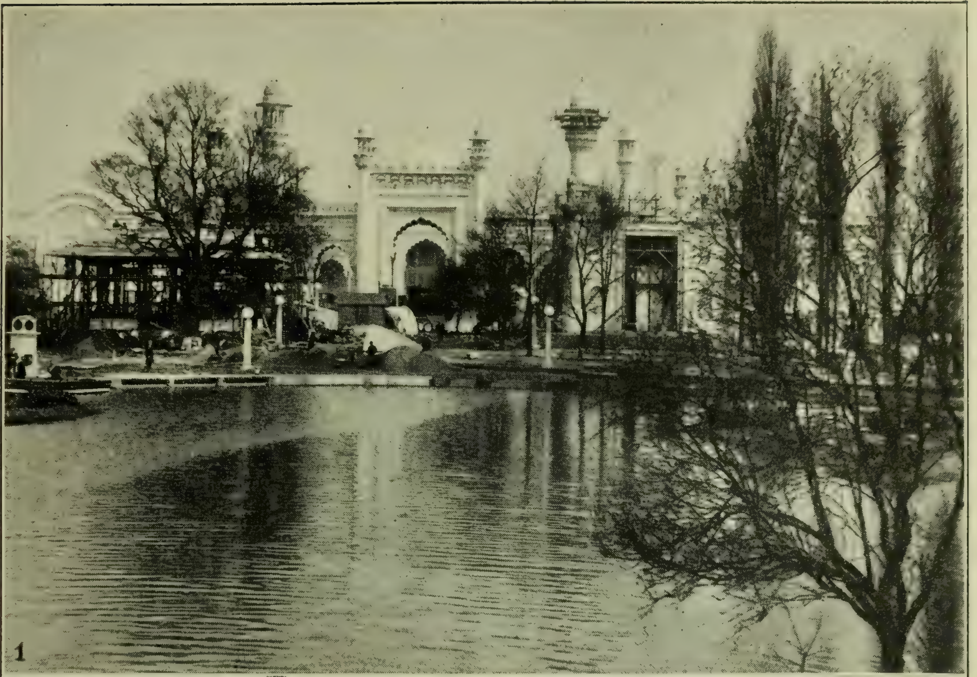
Several important conferences were held during the course of the Exhibition, chief of which were the Empire Mining and Metallurgical Congress, the World Power Conference, the Textiles Conference, and the International Advertising Convention of the Associated Advertising Clubs of the World.

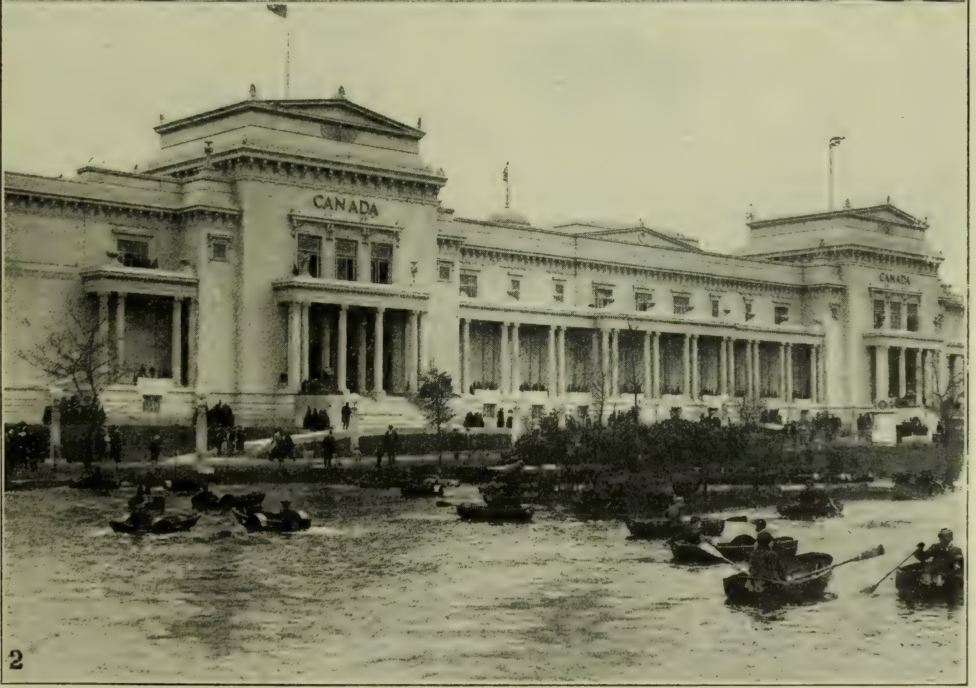
British Guiana, the only British possession on the continent of South America, lies on the north coast, having Dutch Guiana, Brazil, and Venezuela on the east, south, and west respectively. It has an area of about 89,480 square miles. The colony may be roughly divided into three belts: a low-lying, flat, and swampy portion on the north, bordering the coast; a second more elevated tract composed of sand and clay, in the centre; and a still more elevated portion in the south, containing the principal mountain chains in its western part. The chief rivers are the Essequibo, the Corentyne (obstructed by rapids 150 miles from its mouth), the Demerara and Berbice, the Barima (navigable for 80 miles), and the Amacuro, all flowing into the Atlantic Ocean. The climate is hot, but the range of temperature is slight: average maximum, 90°; minimum, 76° F. The rainfall amounts to 120 to 140 inches annually on the coast, and is heavier in the forest region.

The flora is that common to tropical South America. On the southern border, and between the Essequibo and Corentyne, are grassy plains. The centre is clothed with forests yielding valuable timber, of which mora and greenheart and a kind of gutta-percha (balata) are important.

British Guiana is rich in gold; it is washed in all the river valleys, from the Barima in the west to the Berbice; while the mountains are more or less auriferous. From 1886, when mining commenced, to 1924 the total output was valued at £9,642,161; in 1924, 7,187 oz. were mined, valued at £26,940. There are promising diamond fields, principally in the Mazaruni district; diamonds produced in 1924 amounted to 185,586 carats, valued at £858,322. Iron ore, manganese, and bauxite are also found.

The sugar industry is the most important in the colony, and sugar and its by-products, rum, molasses, and molascuit, constitute the major part of its exports. In 1924 exports were valued at £3,393,529 and imports were valued at £2,744,145. Trade is chiefly with Great Britain and Canada. Exports to the United





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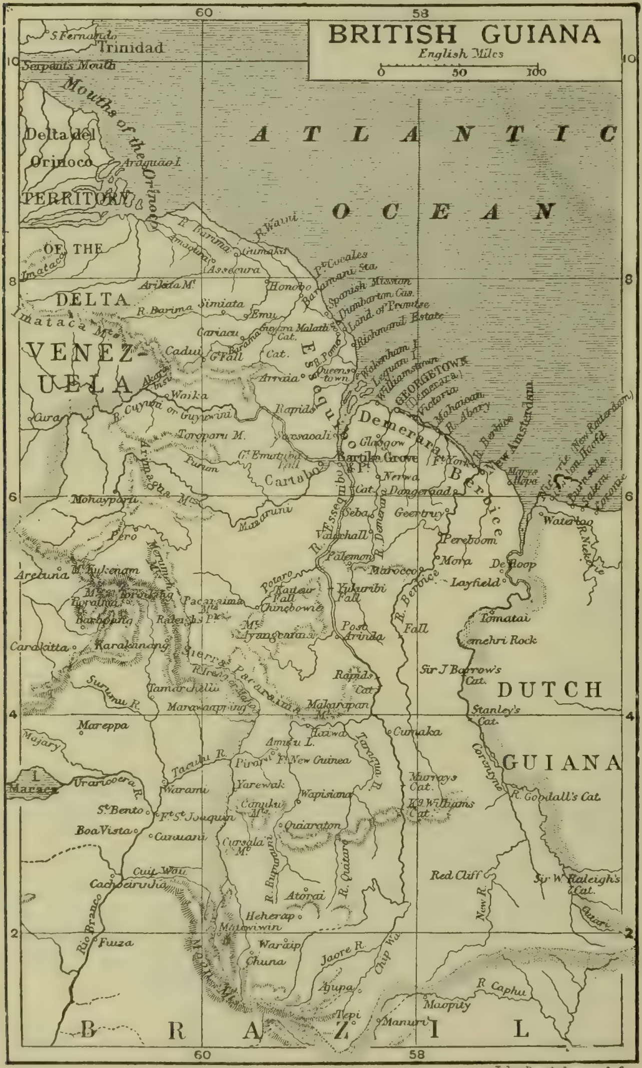
BRITISH EMPIRE EXPOSITION AT WEMBLEY

1. The Lake with the Indian Pavilion in the background. 2. The Canada Building.

States in 1922 amounted to about $450,000; imports to about $4,070,000. The total tonnage entered and cleared in that year was 916,007, mainly British and Dutch. The ports are Georgetown (q. v.), the capital, and New Amsterdam.

The settled part of the country is about one-tenth of the whole, and lies near the coast, along the navigable rivers. Here there are 322 miles of good roads and 98 miles of railway. The colony has telegraphic communication with Europe and the United States, and a good system of postage. There are 75 post offices, 45 of them being telegraph offices, with 575 miles of telegraphs and cables; a telephone exchange in Georgetown and New Amsterdam, with 800 subscribers; and 57 savings banks. In 1921 there were 224 schools, with 36,865 pupils, that received government aid amounting to $150,000.



John Bartholomew & Co.

The inhabitants are chiefly Portuguese from Madeira, Negroes, East Indians, and Chinese (settlement, Hopetown). The aborigines (Caribs, Arawaks, and others) number about 9,150. Pop. of the colony (1921) 297,691.

The colony is divided into three counties, Berbice, Demerara, and Essequibo. It is administered by a governor appointed by the crown, assisted by a Court of Policy, consisting of 7 official members and 8 members elected by the registered voters, and by a Combined Court, which includes, besides the above, 6 financial representatives elected by the voters. The Combined Court has charge of the finances of the colony. In 1921 the revenues amounted to $4,650,945, and the expenditures to $5,740,284.

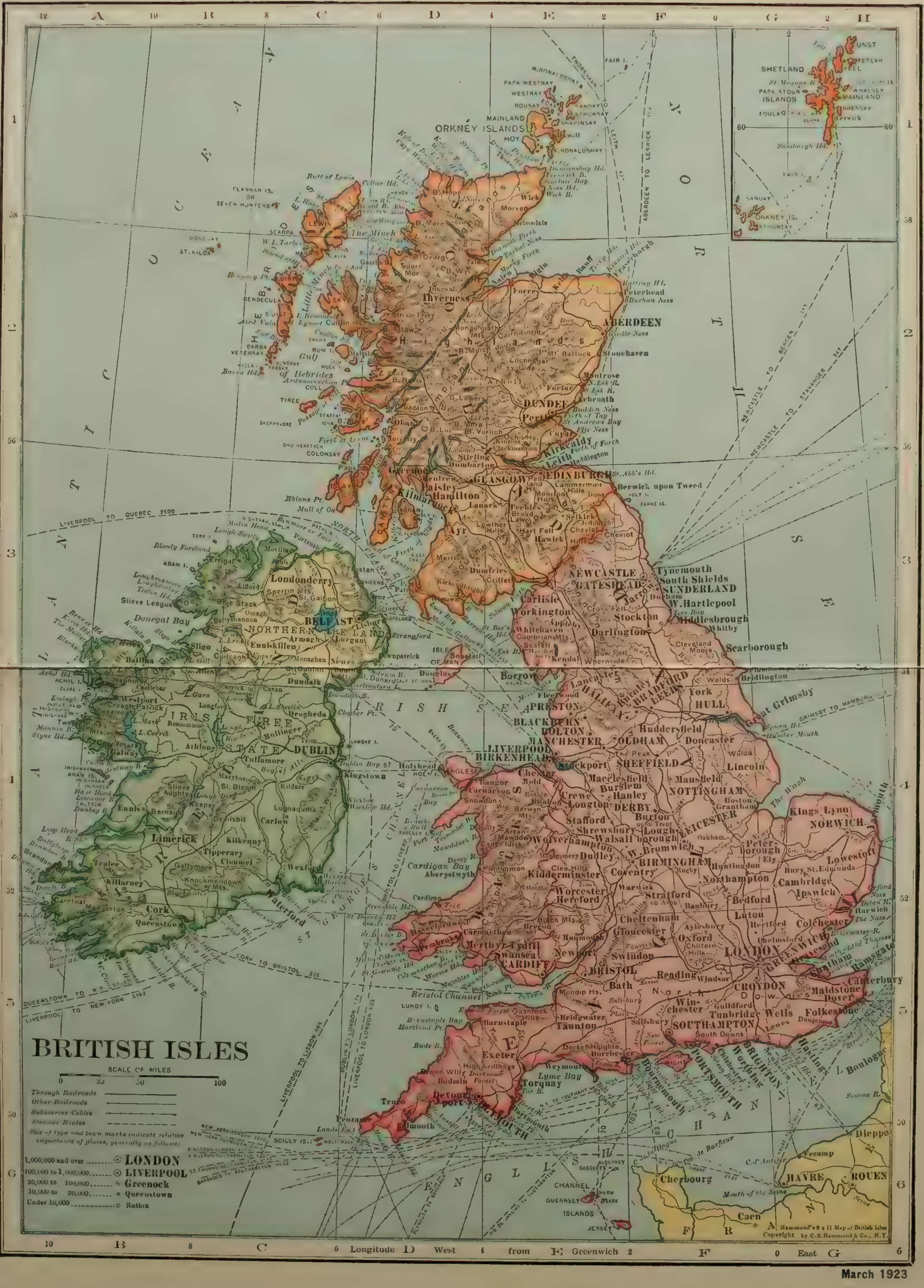
History—The Dutch first settled on the Pomeroon River early in the seventeenth century. In the following century colonization began in earnest, and Essequibo, Demerara, and Berbice were established. In 1781 the British captured these settlements, occupying them until 1783, and again from 1803 to 1814, when the present colony was formed, except that Berbice was administered separately down to 1831. British Guiana has had many frontier disputes with Brazil and Venezuela.

In 1840 a British agent, Sir R. Schomburgk, undertook to define the Venezuelan boundary and mapped out a line, known as the Schomburgk line, giving most of the territory in dispute to British Guiana. In 1850 Great Britain and Venezuela agreed that neither country should occupy the disputed territory, but after mutual accusations of bad faith, Great Britain eventually established a fortified position at the mouth of the Orinoco. Venezuela thereupon occupied the forbidden area, Great Britain demanded reparation, and the United States intervened. Before definite action was taken by the United States, however, a treaty was concluded between Great Britain and Venezuela by which the dispute was submitted to arbitration. According to the award (Oct. 3, 1899), the boundary was fixed mainly according to the Schomburgk line, but certain specified areas were reserved to Venezuela (see VENEZUELA). The Brazil frontier question was submitted to arbitration in 1901, and settled by the award of the king of Italy in 1904

Bibliography.—Consult J. Rodway's *History of British Guiana* (3 vols.), and *Guiana—British, Dutch, and French* (1912); H. Kirke's *Twenty-five Years in British Guiana;* Harrison's *Gold Fields of British Guiana;* Harrison and Stockdale's *Rubber and Balata in British Guiana* (1911); Harris and De Villiers' *Rise of British Guiana* (1911); Bayley's *Handbook of British Guiana* (1912); *British Guiana Handbook* (Georgetown, 1922).

British Gum. See DEXTRIN.

British Honduras, a British crown colony on the Caribbean Sea and the east coast of Central America, between the Mexican state of Yucatan and Guatemala. The northern part is low, and full of swamps and lagoons; south of the Belize River the Cockscomb Mountains extend into the


BRITISH ISLES
SCALE OF MILES
0
25
50
100
Through Railroads
Other Railroads
Submarine Cables
Steamer Routes
Size of type and town marks indicate relative importance of places, generally as follows:
1,000,000 and over .... LONDON
100,000 to 1,000,000....... LIVERPOOL
20,000 to 100,000....... Greenock
10,000 to 20,000....... Queenstown
Under 10,000 .... Ruthin
Hammond's 8 x 11 Map of British Isles
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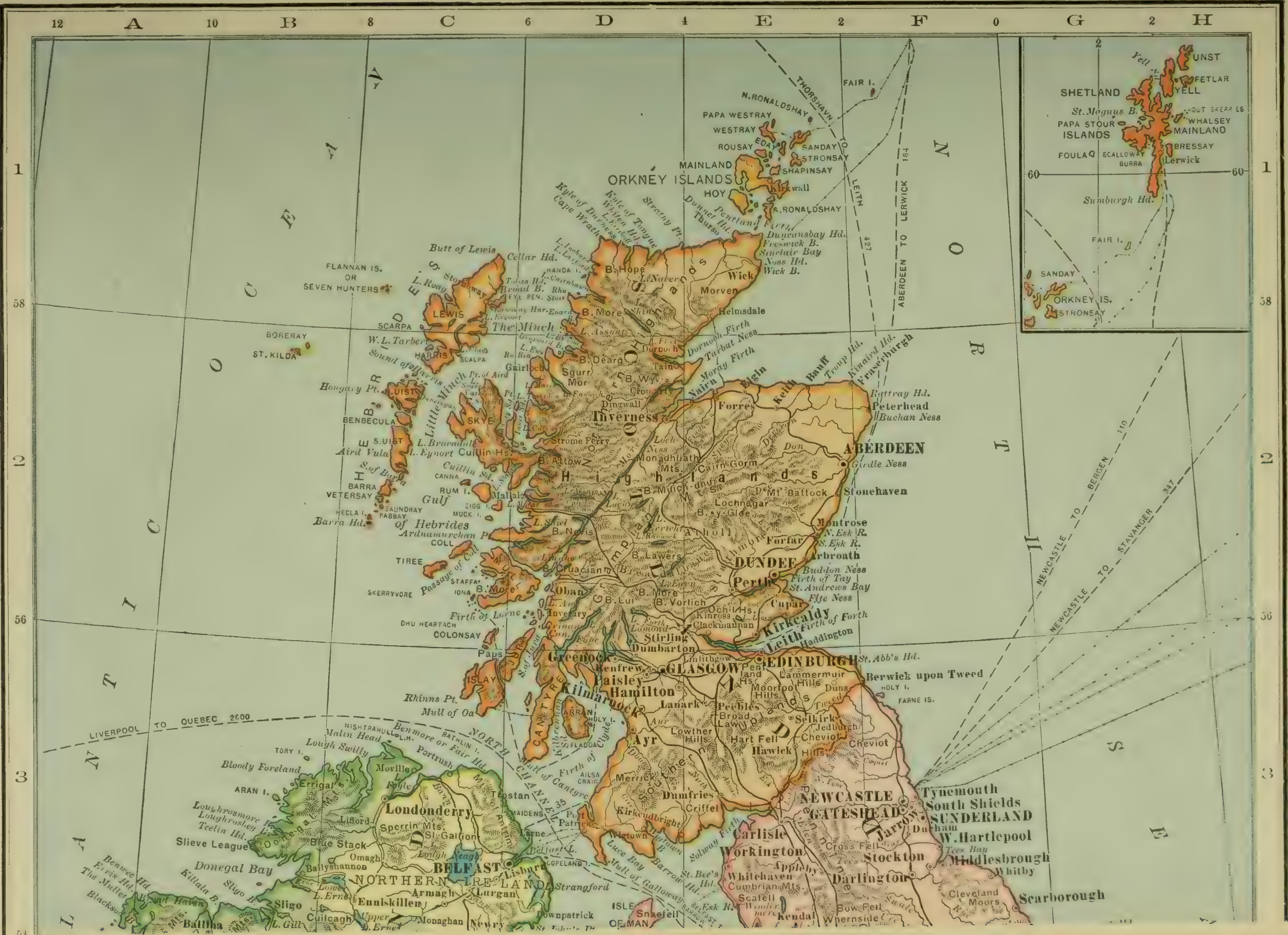
Longitude West from Greenwich
East
ATLANTIC OCEAN
NORTH SEA
IRISH SEA
ENGLISH CHANNEL
ST. GEORGE'S CHANNEL
NORTH CHANNEL
SHETLAND ISLANDS
ORKNEY ISLANDS
HEBRIDES
IRISH FREE STATE
NORTHERN IRELAND
SCOTLAND
ENGLAND
WALES
ISLE OF MAN
CHANNEL ISLANDS
FRANCE
LONDON
LIVERPOOL
MANCHESTER
BIRMINGHAM
GLASGOW
EDINBURGH
DUBLIN
BELFAST
ABERDEEN
DUNDEE
NEWCASTLE
LEEDS
BRADFORD
SHEFFIELD
NOTTINGHAM
LEICESTER
BRISTOL
CARDIFF
SOUTHAMPTON
PORTSMOUTH
PLYMOUTH
NORWICH
HULL
CROYDON
GREENWICH
HAVRE
ROUEN
LIVERPOOL TO QUEBEC 2600
QUEENSTOWN TO N.Y.
LIVERPOOL TO NEW YORK 3162
CORK TO BRISTOL 228
NEWCASTLE TO BERGEN
NEWCASTLE TO STAVANGER 347
ABERDEEN TO LERWICK
GRIMSBY TO HAMBURG
NEW YORK-LONDON 3270
NEW YORK-PLYMOUTH
ST. THOMAS-SOUTHAMPTON
BARBADOS TO SOUTHAMPTON
LIVERPOOL TO LISBON
DUBLIN TO LONDON
LIVERPOOL TO LONDON

March 1923



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ATLANTIC OCEAN
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ORKNEY ISLANDS
MAINLAND
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N.RONALDSHAY
PAPA WESTRAY
WESTRAY
ROUSAY
EDAY
SANDAY
STRONSAY
SHAPINSAY
Kirkwall
S.RONALDSHAY
Pentland Firth
FAIR I.
THORSHAVN
LEITH 427
ABERDEEN TO LERWICK 184
SHETLAND ISLANDS
UNST
Yell
YELL
FETLAR
St. Magnus B.
PAPA STOUR
OUT SKERRIES
WHALSEY
MAINLAND
BRESSAY
Lerwick
FOULA
SCALLOWAY
BURRA
Sumburgh Hd.
60
ORKNEY IS.
FLANNAN IS. OR SEVEN HUNTERS
BORERAY
ST. KILDA
Butt of Lewis
LEWIS
HARRIS
SCARPA
W.L. Tarbert
Sound of Harris
The Minch
Little Minch
HEBRIDES
N. UIST
BENBECULA
S. UIST
BARRA
VETERSAY
Barra Hd.
SKYE
Cuillin Hs.
Gulf of Hebrides
CANNA
RUM I.
EIGG I.
MUCK I.
COLL
TIREE
STAFFA
IONA
SKERRYVORE
DHU HEARTACH
COLONSAY
ISLAY
JURA
CANTYRE
ARRAN
Mull of Oa
Rhinns Pt.
Cape Wrath
Kyle of Durness
Kyle of Tongue
Strathy Pt.
Thurso
Dunnet Hd.
Duncansbay Hd.
Wick
Helmsdale
Morven
B. Hope
B. More
Dornoch Firth
Tarbat Ness
Moray Firth
Nairn
Elgin
Banff
Fraserburgh
Kinnaird Hd.
Rattray Hd.
Peterhead
Buchan Ness
ABERDEEN
Girdle Ness
Stonehaven
Highlands
Inverness
Dingwall
Gairloch
Stromeferry
Monadhliath Mts.
Cairn Gorm
Lochnagar
Mt. Battock
B. Nevis
Grampians
Oban
Inveraray
Forres
Keith
Montrose
Arbroath
Forfar
DUNDEE
Perth
Firth of Tay
St. Andrews Bay
Fife Ness
Cupar
Kirkcaldy
Firth of Forth
Leith
Haddington
Stirling
Dumbarton
Greenock
Paisley
Renfrew
GLASGOW
EDINBURGH
St. Abb's Hd.
Berwick upon Tweed
Hamilton
Kilmarnock
Lanark
Ayr
Peebles
Selkirk
Jedburgh
Cheviot
Hawick
Lowther Hills
Hart Fell
Dumfries
Criffel
Kirkcudbright
Wigtown
Mull of Galloway
Firth of Clyde
Mull of Cantyre
NORTH CHANNEL
Solway Firth
Carlisle
Workington
Whitehaven
Cumbrian Mts.
NEWCASTLE
GATESHEAD
Tynemouth
South Shields
SUNDERLAND
Durham
W. Hartlepool
Stockton
Middlesbrough
Darlington
Whitby
Scarborough
Cleveland Moors
Kendal
ISLE OF MAN
LIVERPOOL TO QUEBEC 2600
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NORTHERN IRELAND
Londonderry
BELFAST
Lisburn
Lough Neagh
Armagh
Lurgan
Enniskillen
Strangford
Downpatrick
Newry
Monaghan
Omagh
Sperrin Mts.
Lifford
Donegal Bay
Sligo
Ballina
Bloody Foreland
Malin Head
Lough Swilly
Moville
Portrush
TORY I.
ARAN I.
Errigal
Slieve League
Ballyshannon

colony from the Guatemalan boundary. South of these mountains, hilly country nearly 2,000 feet high connects them with the ranges of Central Guatemala. The more accessible forests having been well worked, the quality of the timber is declining; but the cultivation of chicle, fruit, cacao, sugar, and india rubber is being extended. The climate generally is damp and hot, but not unhealthy. The temperature ranges from 50° to 98° F. The average lies between 75° and 80°, but this is considerably tempered by the prevailing sea breezes.

For the fiscal year 1912–13 the exports were valued at $2,935,000, the principal items being mahogany ($1,065,000), chicle gum ($960,000), cedar, cocoanuts, bananas, and logwood; while the imports were valued at $3,594,000, the chief items being gum, cotton goods, provisions and clothing, and machinery. In 1912 trade with the United States amounted to $2,310,000 in exports and $1,365,000 in imports. Telegraph and telephone lines connect Belize with Corozal, Consejo, El Cayo, and Punta Gorda. The population is composed chiefly of Indians, only 1 per cent. being Europeans. The capital and chief port is Belize (q.v.). Area, 8,600 square miles. Pop. (1901) 37,489; (1913) 41,000. Consult Gibbs' *History of British Honduras;* Bristowe and Wright's *Handbook of British Honduras.*

British Isles, THE, an extensive archipelago west of the Continent of Europe, from which it is separated by the North Sea, the Strait of Dover, and the English Channel. The whole archipelago consists of the two large islands of (*a*) Great Britain, comprising England, Wales, and Scotland; (*b*) Ireland; together with (*c*) about 5,000 small islands lying in groups to the north (Orkney and Shetland), to the west (Hebrides, Isle of Man, the small coast islands of Ireland, and the Scilly Islands), and to the south (Isle of Wight and the Channel Islands, the last named belonging geographically to France). Total area, 121,390 square miles. Pop. (1911) 45,365,599. See ENGLAND AND WALES; SCOTLAND; IRELAND; etc.

British India. See INDIA.

British Museum. In 1753, under the will of Sir Hans Sloane, his books, MSS., natural history collections, and curiosities were offered to the British nation for the sum of $100,000, on condition that they should be kept together in a museum. An Act of Parliament was passed the same year, providing for the acceptance of this offer; for the purchase, for $50,000, of the collection of MSS. formed by Robert Harley, Earl of Oxford; and for the proper housing of the earlier collection of MSS. formed by Sir Robert Cotton in the reign of James I., and given to the nation by his grandson in 1700, but so badly cared for that a fire in 1727 destroyed or damaged a considerable part of them. Montague House, Bloomsbury, was purchased for $51,250, and opened (in 1759) under the title of the British Museum, the three collections already named having been previously augmented (in 1757) by George II.'s gift of the royal library formed by successive kings and queens of England, from Henry VII. to Charles II.

When the museum was opened, its means were so limited that for a long time the trustees could not spend as much as $500 on purchases in any single year. The regulations at this time only allowed a maximum of thirty visitors in any one day, and the use of the reading room was similarly restricted. In 1772, however, the vases, antiquities, and drawings of Sir William Hamilton were purchased by parliamentary vote for $42,000; in 1799 the Rev. Clayton M. Cracherode bequeathed to the museum his fine collections of books and prints; the Egyptian antiquities obtained under the capitulation of Alexandria were presented by George III. in 1802; the Towneley marbles, coins, and drawings were bought between 1805 and 1814 for $141,000, the Lansdowne manuscripts in 1807 for $24,625, the Phigalian marbles in 1815 for $75,000, the Elgin marbles in 1816 for $175,000, and the Burney library in 1818 for $67,500. Lastly, in 1823, by an arrangement with his successor, the magnificent library formed by George III. was transferred to the museum.

These large additions, with the more liberal regulations adopted in 1810, by which the public were admitted freely between ten and four on three days in each week, demanded an increase of space far in excess of the accommodation offered by Montague House. A new wing was first erected on the west side of the building for the reception of the Towneley and Elgin marbles; next a fine gallery was opened on the east side in 1827 for the king's library (books collected by George III.); and these wings were finally joined by galleries on the north side, and by an imposing façade in the Ionic style, from the designs of Sir Robert Smirke, the whole building being complete in 1847.

Meanwhile, however, under the vigorous administration of Anthony Panizzi (an Italian refugee, who became keeper of the printed books in 1837), the library had been growing by leaps and bounds. Panizzi obtained from the government an annual grant of $50,000 to make good its deficiencies; vigorously enforced the copyright act, by which a copy of every book printed in the United Kingdom must be delivered to the museum within one month of publication; and, by his influence with the Right Hon. Thomas Grenville, procured the bequest (in 1847) of the magnificent Grenville library, a collection of 20,240 volumes.

As the books multiplied readers multiplied also; and to provide room for both, in 1854 a plan of Panizzi's was accepted by which the quadrangle round which the galleries of the museum were built was to be occupied by a great circular reading room, with a diameter of 140 feet and a height of 106 feet, surrounded by galleries constructed entirely of iron, containing twenty-five miles of shelving, and accommodating about a million books. This building was opened in 1857, and both the circular reading room and the iron 'bookstack' (in which the light admitted from a glass roof penetrates through the gaps between the railings which form the floors) have served as models for many similar constructions. By the subsequent invention of 'sliding' bookcases, which run forward from the face of the fixed ones, the miles of shelving (including those in the older parts of the library) were increased to about fifty, though the method of counting pamphlets only according to the volumes in which they are bound has restricted the official estimate to between 2,000,000 and 3,000,000 volumes.

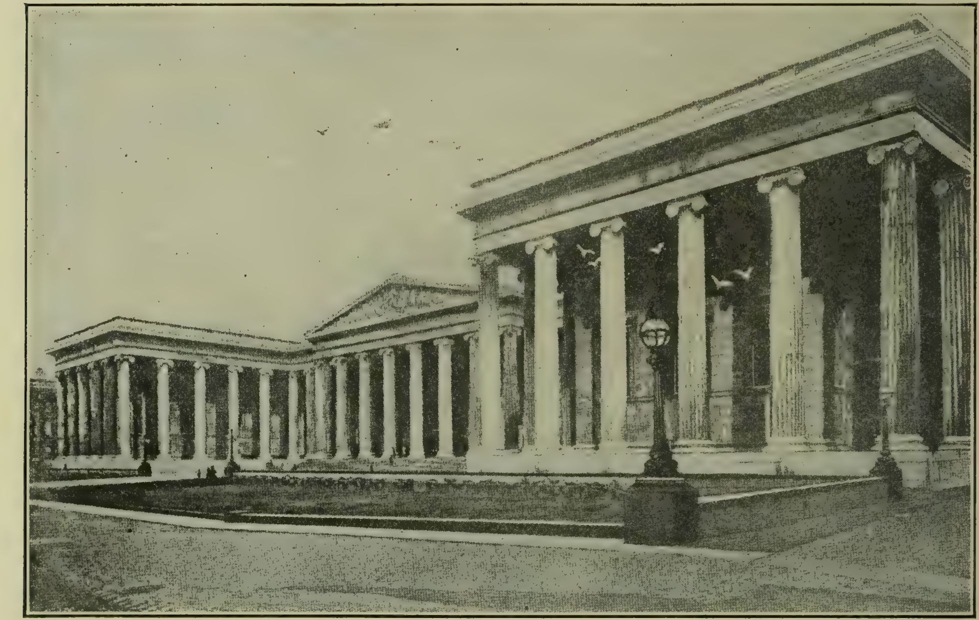
Meanwhile other departments of the museum also grew rapidly, and as early as 1860 it was determined to move the natural history collections to South Kensington, where the site of the exhibition of 1862 was purchased the year after it closed. A new terra-cotta building, from the designs of Alfred Waterhouse, was begun in 1873, finished in 1880 (the main contract having been for $1,750,000), and opened the following year. The style is that known as Early Romanesque, modelled on that which obtained in Lombardy and the Rhineland from the tenth to the twelfth century. The frontage is 675 feet, the dimensions of the splendid hall, which forms the chief feature of the building, being 170 feet long, 97 feet wide, 72 feet high, and the exhibition galleries 278 feet by 50 feet.

The removal of the natural history collections from Bloomsbury left space there for the display of the ethnographical collections given by Henry Christy in 1865, and, with a bequest of $325,000 by William White (which, though made in 1823, only accrued on the death of his widow in 1879), the White Wing was built, jutting out from the southeast angle, and providing fine rooms for the display of pottery and glass, and prints and drawings. During the tenure of the chancellorship of the Exchequer by Sir William Harcourt (1892–4) the ground at the back of the museum was purchased on terms liberally offered by the Duke of Bedford, and the new annex built thereon was formally opened in 1911.

The total annual grant in 1909–10, including that of the British Museum of Natural History, amounted to $992,000. The number of visitors to the parent museum in Bloomsbury in 1909 was 708,836, of whom 276,040 were students in the reading room or other departments. The number of visitors to the Natural History Museum at South Kensington (including 61,465 on Sundays) was 535,116, of whom 20,068 were students. Both museums are opened free to the public every week day except Good Friday and Christmas Day, and on Sundays from 2 P.M. till dusk. Admission to the reading rooms and studies is granted to students over twenty-one years of age, on the written recommendation of a householder, sent at least two days previously. The recommendations of lodging-house keepers and hotel proprietors are not accepted.

Among the more notable of the special collections at the British Museum itself are the sculptures from the Parthenon at Athens (fifth century B.C.), known as the Elgin Marbles, removed to England by Lord Elgin in 1801–3, and purchased in 1816; the sculptures of the mausoleum at Halicarnassus, excavated in 1857; the Assyrian sculpture from the palace of Assur-nasir-pal (B.C. 885–860) at Nimrud; the bas-reliefs from Nineveh of the reigns of Tiglath-pileser III. (B.C. 745–737), Sennacherib (B.C. 705–681), and Assur-bani-pal (B.C. 668–626), and the cuneiform inscribed slabs which formed Assyrian books; the series of Egyptian sculptures ranging from B.C. 4000, and of mummies and objects found in their tombs; the exhibition of articles illustrating the different religions of the world; the collections of tools, weapons, ornaments, and dress of races in all the earlier stages of civilization in every continent; the mediæval antiquities, Roman remains in Great Britain, collection of gold ornaments, of coins and medals, and ancient Greek vases; lastly, the collections illustrating the history of books in manuscript and print, including autographs of many famous men and women.

Since 1909 important acquisitions have been added to the collection of MSS., coins, and antiquities. In the department of printed books eighty old English books have been added to the library, and include works from the presses of Julian Notary, Richard Pynson, Wynkyn de Worde, and Thomas Berthelet.



The British Museum.

At the natural history museum the great hall is occupied by an 'introductory' collection illustrating the variation of animals under domestication; the adaptation of their color to environment; the phenomena of albinism, melanism, etc. The western galleries are devoted to stuffed specimens of animals and to their skeletons, the eastern galleries to minerals and botany. Among other collections are the birds' eggs and the butterflies, and the Gould collection of humming birds.

While the usefulness of the museum must always be gauged by the help it renders to real students, much of late years has been done to increase its popularity with casual visitors. To every article exhibited is attached a label, giving its name, and where needful, something of its history. In departments, the bulk of whose treasures cannot be displayed, selections are placed in show cases, among the most interesting of which are those containing autographs of celebrated personages, ancient, Oriental, and illuminated manuscripts, books illustrating the history of printing in various countries, rare bindings, etc. During the last few years also exhibitions have been given in the King's Library in connection with the centenaries of Luther, Wyclif, etc. Consult Shelley's *The British Museum: Its History and Treasures* (1911).

British New Guinea. See NEW GUINEA.

British North America Act, passed by the British Parliament (March 29, 1867) to provide for the union of Canada, Nova Scotia, and New Brunswick into a federation with the title of 'The Dominion of Canada.' By the British North America Act of June 29, 1891, the Canadian Parliament was empowered to create new provinces, and has since done so. The Dominion now includes the whole of British North America, except Newfoundland and the Bermudas.

British North Borneo. See BORNEO.

British South Africa. See SOUTH AFRICAN UNION; RHODESIA; BECHUANALAND; BASUTOLAND.

British South Africa Company, THE, was chartered on Oct. 29, 1889, through the efforts of Cecil Rhodes (q.v.), its animating spirit until his death. The company had great administrative powers in the region known as Rhodesia, being authorized to promote trade and commerce, and to work and develop mineral and other concessions over an area of 750,000 square miles. Dr. Jameson (q.v.) was the administrator of the company's territories till the Transvaal Raid (1895–6), when he was succeeded by Earl Grey.

British West Africa. See GAMBIA; GOLD COAST; LAGOS; NIGERIA; SIERRA LEONE.

British West Indies. See WEST INDIES.

Britomartis, brit-ō-mär′tis, a Cretan divinity, daughter of Zeus and Carme; like Artemis, a virgin huntress. Minos loved and pursued her; to escape from him she threw herself into the sea, but was saved by Artemis, who made her a goddess. In Crete she had the surname Dictynna. Clearly she is Artemis under another form.

Brit′on Ferry, seaport, Glamorgan, Wales, at the mouth of the River Neath; 2 miles southwest of Neath. The docks are in direct communication with Merthyr-Tydvil and Aberdare and the Rhondda Valley. There are coal mines and iron works. Pop. (1911) 8,474.

Brit′tany (French *Bretagne*), the great northwest peninsula of France, extending in triangular form into the sea, its base resting on Normandy, Maine, Anjou, and Poitou, its sides washed by the Channel and the Atlantic Ocean. In earlier times it formed, with the name of duchy, one of the provinces of France; now it forms the five departments of Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, and Loire-Inférieure, with a total area of 13,640 square miles, and a population of 3,260,000. Before the Revolution this district fell into the nine dioceses of Rennes, Dol, Nantes, St. Malo, and St. Brieuc, Tréguier, Vannes, Quimper, and St. Pol-de-Léon; of which the first five made up the two popular divisions, the names of which are still in general use—Upper Brittany (*Haute-Bretagne*); the last four, Lower Brittany (*Basse-Bretagne*).

Though the height of its mountains nowhere exceeds 1,150 feet, their structure gives to the peninsula a wild and savage aspect. Clay slate forms the centre of the country, and masses of granite rise in the north and the south. The climate is often foggy, and subject to violent storms of wind. Large tracts of land lie uncultivated; but in the well-watered valleys vegetation is luxuriant.

The peculiar shut-in situation and the characteristics of soil and climate in Brittany seem to have had a powerful effect on the character of its people. The Breton has generally a tinge of melancholy in his disposition; and often conceals, under a dull and indifferent exterior, a lively imagination and strong feelings. He is passionately attached to his country and his customs, and is strongly averse to change. A bold seaman and steady soldier, he is devoted in his loyalty to time-honored authority in church and state, and is capable of extraordinary devotion and sacrifice of self for his ideal. The Bretons would be ignorant and uncivilized but for a quite extraordinary wealth of traditional song and story, that serves effectively all the purposes of a national culture. Perhaps nowhere in the world has folklore reached such a high development, and this not less in quality than in quantity; for no traditional stories come near the Breton folk tales, no popular poetry the Breton folk songs. It must not be forgotten that there has long existed a fairly abundant literature, at least in religious subjects, in the Breton language, and that even in our day many natives are capable of reading this who do not read, and need not even speak, French. No part of Europe contains so many megalithic monuments as Brittany.

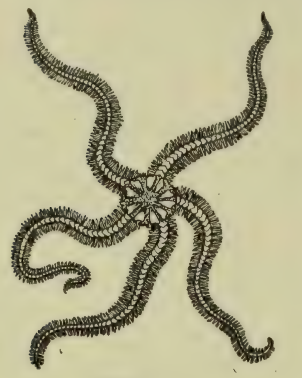
In ancient times, Brittany, under the name of *Armorica*, was the centre of the confederated Armorican tribes, who were of Celtic origin. Later it was known as *Provincia Lugdunensis Tertia*, but it never was more than nominally under Roman sway. Already entirely liberated in the fourth century, it became divided into several allied republican states, which afterward passed into petty monarchies. Brittany became subject to the Franks in the reign of Charlemagne, and was handed over by Charles the Simple to the Northmen in the tenth century. After fierce struggles the Bretons at length acknowledged the suzerainty of the Norman dukes. Geoffroi, count of Rennes, was the first to assume the title of duke of Bretagne, in 992. The duchy of Brittany was incorporated with France in 1532 by Francis I., to whom it had come by marriage; and subsequently it shared in the general fortunes of the kingdom.

See BRETON LANGUAGE AND LITERATURE.

Consult Le Saint's *La Bretagne Ancienne et Moderne;* Joanne's *Bretagne;* Gourcuff's *Gens de Bretagne;* La Monneraye's *Géographie Ancienne et Historique de la Bretagne;* De Laborderie's *Histoire de Bretagne;* Dean Church's essay in his *Miscellanies;* and books on Brittany by Baring-Gould, Mennes (1905), and Le Breiz (Eng. trans. 1906).

Brittle-stars (Ophiuroidea), one of the classes of Echinodermata, not far removed from starfishes, but differing in their more centralized body, more sharply defined arms, and more active habits. Compared further with starfishes, the brittle-stars are more muscular and less limy; the brittle arms do not contain digestive cæca from the gut nor reproductive organs, and are supported by an axis of central limy bodies like vertebræ;

the tube feet are smaller, probably simply tactile, and locomotion is effected by the muscular wriggling of the arms; the groove on the ventral surface of the starfish arm is here closed in by limy plates; the alimentary canal is blind—that is, without anus; the entrances to the water-vascular system (madreporic plates) are ventral; and the larval form is quite different. *O. aculeata* is common in tide pools along the Atlantic Coast. See ECHINODERMATA.



Brittle-star.

Britz, village, Potsdam district, province Brandenburg, Prussia; 4 miles south of Berlin. Pop. (1910) 11,503.

Brive, or BRIVE-LA-GAILLARDE, brēv′lȧ-gȧ′yärd′ (ancient *Briva Curretia*), town, department Corrèze, France, on the River Corrèze; 16 miles by rail southwest of Tulle. It has manufactures of carpets, paper, and candles; trades in preserves, *pâté-de-foie gras*, geese, truffles, wine, and nuts. Pop. (1901) 19,496; (1911) 21,486.

Brix′en, town, episcopal see, and summer resort in Tyrol, Austria, in the Puster valley; 24 miles by rail northeast of Bozen. Its cathedral, with two copper-roofed towers, dates from the fifteenth century. The bishopric was founded in the fourth century, and from 1179 to 1803 its bishop was a prince of the empire. Pop. (1901) 5,767; (1911) 6,551.

Brixham, briks′*a*m, seaport, Devonshire, England, on the Torbay, opposite Torquay; 25 miles south of Exeter. It is the headquarters of the Torbay fishing industry, and great quantities of fresh fish are sent to London, Bath, and Bristol. There are iron mines, limestone quarries, and mineral-paint works. A cavern 600 feet long on Windmill Hill, discovered in 1858, contained bones of the mammoth, rhinoceros, horse, reindeer, hyena, bear, etc., besides palæolithic flint implements. William of Orange landed here in 1688. Pop. (1901) 8,090; (1911) 7,954.

Brixlegg, village, Tyrol, Austria, near the River Inn; 20 miles by rail northeast of Innsbruck. It has important smelting works for silver and copper ores found in the neighborhood, as at Rattenberg. Alt. 1,750 feet. The village stands in a beautiful position, which makes it a favorite summer resort. Passion plays were represented here with great success in 1868, 1873, and 1883. Pop. 1,200.

Brix′ton, district, Lambeth parish, London, England. See LONDON.

Bri′za, or QUAKING GRASSES, a small genus of plants belonging to the order Gramineæ, characterized by their short, broad, flat, several-flowered spikelets, hanging at the extremities of slender branches, and thus in constant motion in the slightest breeze. See GRASSES.

Brizures, brē-zūr′, in heraldry, variations on the original arms of a family, introduced to distinguish cadets from the head of the family and from each other. See HERALDRY.

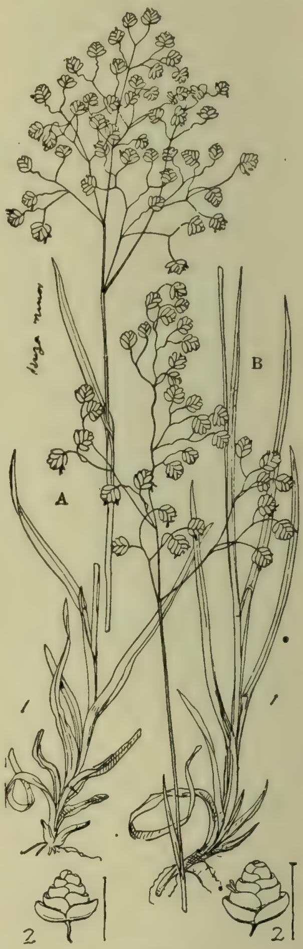
Broach, BAROACH, or BHARUCH, town, Gujarat, Bombay Presidency, India, on the River Narbada; 228 miles north of Bombay by rail. Eighteen hundred years ago Broach was one of the chief ports of West India, and its foreign commerce did not absolutely disappear until the end of the eighteenth century. English and Dutch factories were established here during the sixteenth century. It has an export trade in raw cotton, grain, and seeds. Broach was taken by the British in 1772, ceded to Sindhia in 1783, and again stormed by a British force in 1803, since which date it has remained a British possession. Pop. 43,000.

The district of Broach has an area of 1,467 square miles, and a population of 300,000.

Broad Arrow, the cognizance of Viscount Sydney, earl of Romney, who was master-general of the ordnance in Great Britain (1693–1702); first used in his day as the royal mark on government stores. To deface or obliterate this mark is felony; while unlawful possession of goods so marked is punishable with forfeiture and a penalty of $100.

Broad Arrow, mining town, West Australia; 24 miles northwest of Kalgoorlie. Pop. (district) 3,000.

Broadbent, SIR WILLIAM HENRY (1835–1907), English physician, was born in Huddersfield, and studied medicine at Owens College, Manchester, and in Paris. He was physician-in-ordinary to the Prince of Wales (1892), physician-extraordinary to Queen Victoria (1898–1901), and physician-in-ordinary to King Edward VII. He was created a baronet in 1893, and was chief of the civil medical staff in South Africa in 1899. He was author of *An Index of Diseases* (3d ed. 1883); *The Pulse* (1890); *The Heart* (1897).



Briza.

A, *Briza minor;* B, *Briza media;* 1, root; 2, spikelet.

Broadbill, a popular name for certain birds. See SCAUP; SHOVELLER; SPOONBILL.

Broad'head, GARLAND CARR (1827–1912), American geologist, was born in Albemarle county, Va. He studied at the University of Missouri and after several years' service as a civil engineer became assistant State geologist of Missouri (1857–61). After filling various public positions, among them that of assistant geologist of Illinois (1868), he was State geologist of Missouri (1873–5) and professor of geology at the University of Missouri (1887–97). He was a special agent of the Tenth Census on the quarry industry in Missouri and Kansas, and a member of the Missouri River Commission (1884–1902).

Broad'hurst, HENRY (1840–1911), English labor leader, was a blacksmith and a stonemason, who became secretary of the Labor Representation League in 1875. He was M.P. for Stoke-on-Trent (1880–5), for Bordesley (1885–6), for Nottingham (1886–92), and for Leicester (1894–1906). He was appointed Under-Secretary of State for the Home Department (1886), and served on a number of royal commissions (Housing of the Working Classes, Condition of Aged Poor, etc.). He promoted the Leasehold Enfranchisement Bill, and wrote a *Handy Book on Leasehold Enfranchisement* with Sir R. T. Reid (1885), and *The Story of my Life,* an autobiography (1901).

Broad River, a river of the Southeastern United States which joins the Saluda at Columbia, S. C., to form the Congaree River. It rises in the southwestern part of North Carolina, in the Blue Ridge, passes into South Carolina, and flows in a general southeasterly direction through a course of about 220 miles, more than half of which is navigable.

Broads, THE, a series of picturesque shallow fresh-water lakes in Norfolk and Suffolk, England, but mainly in the former county, some in the course of rivers, others connected with rivers by artificial channels.

Broadsides. See CHAPBOOKS.

Broad'stairs, town, England, Isle of Thanet, Kent, less than two miles northeast of Ramsgate. It was a favorite resort of Charles Dickens, whose residence there has been named Bleak House, although it has no connection with his novel of that name. The North Foreland lighthouse, visible from the cliffs, is said to have suggested to Wilkie Collins the title of his novel, *The Woman in White.* Sand for filters is exported. Pop. (1921) 15,465.

Broadsword. See FENCING.

Broad-winged Hawk. See BUZZARD.

Broadwood, ROBERT GEORGE (1862–1917), British soldier, took part (1897) in command of the Egyptian cavalry, in the engagement at Abu Hamed and the occupation of Berber, and in 1898 fought in the battles of the Atbara and Khartum. He commanded the 2nd Cavalry Brigade in the South African War and was cleverly ambushed by General DeWet at Sanna's Post (Koorn Spruit). He was engaged in the 'sweeping' operations in the northeastern portions of the Orange Free State in 1901, and on July 13, as the result of a clever manœuvre, he surprised the town of Reitz. He also captured Gen. A. Cronje, General Wessels (Steyn's brother-in-law), and many other prisoners. In 1904 Broadwood was appointed brigadier-general on the staff to command the Bloemfontein district. In 1906 he was in command in China and when the Great War broke out was in command of troops in East Anglia. He died of wounds received in action.

Broca, brō-kȧ', PIERRE PAUL (1824–80), French anthropologist, was born in Sainte-Foy-la-Grande, Gironde. In 1853 he became professor of surgical pathology at Paris and surgeon to the four great hospitals. He founded the Anthropological Society of Paris (1859), established *La Revue d'Anthropologie* (1872), and opened the famous Ecole d'Anthropologie in Paris (1876). He was especially interested in craniology, and it was he who located the seat of articulate speech in the left frontal lobe of the brain (the convolution of Broca). Broca published many scientific works, including *Des anévrismes et de leur traitement* (1856); *Instructions générales pour les recherches anthropologiques* (1865; 2nd ed. 1879); *Mémoires sur les caractères physiques de l'homme préhistorique* (1869); *Mémoires d'anthropologie* (1871–83, 1888). He was made a member of the Legion of Honor in 1868 and in 1872 founded the Association Française pour l'Avancement des Sciences.

Brocade', a silken fabric with a pattern of raised figures. Oriental brocades date from a remote period, but there were probably no European stuffs of this nature earlier than the 13th or 14th century, when they were made in Italy and Spain. Except for those woven in modern times, brocades are very generally composed in part of gold, silver, or gilt silver threads.

Broccoli, brok'ō-li, a hardy variety of cauliflower (q. v.).

Broch, brok, a term etymologically the same as borough, burgh, and borg, applied in Northeastern Scotland to an archaic round tower of a peculiar type. Brochs had no exterior windows, and the only aperture in the outer wall was a small doorway at the base. They were probably erected as places of refuge in the first three centuries of the Christian Era. Some four or five hundred are in existence. They are found only in Scotland.

Brochure, a French term equivalent to the English pamphlet (q. v.).

Brock, SIR ISAAC (1769–1812), British soldier, the 'hero of Upper Canada,' was born on the Isle of Guernsey, and entered the British army as an ensign in 1784. He served in the West Indies, Holland, Denmark, and the Baltic, and was a lieutenant-colonel when he went to Canada in 1802. In 1803 he put down a formidable rising of rebellious troops, and in 1810 he was commissioned lieutenant-governor of Upper Canada, and began preparations for war with the United States. On Aug. 16, 1812, he received the surrender of Gen. William Hull (q. v.) at Detroit, and as a reward for his services, he was made a Knight of the Bath. He was killed while leading his men against the Americans at the battle of Queenston, Ont., on the Niagara frontier, Oct. 13, 1812. The British House of Commons erected a monument to his memory in St. Paul's cathedral, London, and later a splendid monument was erected on the heights of Queenston, under which Brock was buried on the 12th anniversary of his death. Consult Tupper's *Life and Correspondence.*

Brock, SIR THOMAS (1847–), English sculptor, was born in Worcester. He was a pupil of J. H. Foley, R.A., the leading opponent of the then prevailing formalism in sculpture, and afterwards his assistant. On his master's death in 1874, Brock was commissioned to complete his O'Connell monument for Dublin, his statue of Lord Gough, also for Dublin, and his statue of Lord Canning for Calcutta. Among his other works may be mentioned the equestrian statue of the Black Prince, in Leeds; a bronze bust of Lord Leighton; a marble bust of Queen Victoria; the Longfellow bust in Westminster Abbey; and *A Moment of Peril* in the Tate Gallery, London. Probably his finest work is the Queen Victoria Memorial before Buckingham Palace, on which he spent nine years.

Brock'en, or BLOCKSBERG (anc. *Mons Bructerus*), the central summit of the Harz Mountains, Germany, 3,747 ft. high, 20 miles southwest of Halberstadt. The Brocken was one of the last strongholds of the heathen faith of the ancient Germanic peoples, and here on the night of the first of May (Walpurgis night) the witches were said to hold their unholy revels (the Witches' Sabbath). The mountain is also interesting for the 'spectre of the Brocken,' caused by shadows falling upon a wall of mist at sunrise.

Brockes, brok'es, BARTHOLD HEINRICH (1680–1747), German poet, was born in Hamburg. He studied at Halle and Leyden, and after some time spent in travel was elected to the Hamburg Senate. He carried out several missions—as to Vienna (1721), and to Copenhagen (1724)—and was in 1735 appointed for a period of six years bailiff at Ritzebüttel, where he composed *Landleben zu Ritzebüttel.* His principal work is *Irdisches Vernügen in Gott* (9 vols. 1721–48), a collection of poetical and religious meditations. He also translated into German Pope's *Essay on Man* (1740) and Thomson's *Seasons* (1745).

Brockhaus, brok'hous, FRIEDRICH ARNOLD (1772–1823), German publisher, founder of the house which bears his name, was born in Dortmund in Westphalia. He started business in 1802, but removed to Altenburg in 1810, before which date he had purchased the *Konversations-Lexikon* of Löbel. He issued a new (2d) edition of that work in 1812, which made both his reputation and his fortune. The 14th edition was published in 1904. In 1817 Brockhaus removed to Leipzig, and added to his publishing trade that of bookseller, in which he was equally successful. In his enterprise he was ably assisted by his son HEINRICH (1804–74), who, in conjunction with Friedlein and Avenarius, in 1837, established, at Paris and Leipzig, a publisher's shop or book-store of German and foreign literature, which was carried on till 1844. HERMANN (1806–77), another son, became a learned Oriental scholar, studying Indian literature in the German colleges, as well as at Copenhagen, Paris, London, and Oxford, and subsequently occupying the chair of Indian literature at Jena (1839) and at Leipzig (from 1841). He edited and translated many Sanskrit works.

Brockram ('broken rock'), a term locally applied to certain breccias belonging to the Permian system, and found at Penrith, Appleby, and elsewhere in that part of England. They appear to have been originally angular broken material which accumulated on the shores of the New Red Sandstone lakes, and are often full of limestone fragments, and sometimes dolomitic.

Brock'ton, city, Massachusetts, Plymouth county, on the New York, New Haven and Hartford Railroad; 20 miles south of Boston. It is a flourishing industrial city, being especially known for its boot and shoe interests. Shoe tools, woolens, rubber goods, paper boxes, pianos, furniture, and sewing machines are also important articles of manufacture. According to the Federal Census for 1919, industrial establishments number 217, with a capital of $54,715,520, and products valued at $117,855,025. Brockton was not incorporated under its present name until 1874, having before that time formed part of Bridgewater, as North Bridgewater. Its growth has been rapid. Pop. (1900) 40,063; (1910) 56,878; (1920) 66,254.

Brock'ville, port, Ontario, Canada, county seat of Leeds and Grenville counties, on the St. Lawrence River, and on the Grand Trunk, the Canadian Pacific, and the Canadian National Railroads and steamboat lines leading to all ports on the Great Lakes. It is connected by ferry with Morristown, New York, and is 70 miles south of Ottawa. There is a U. S. consular agency here. Manufactured products include farming implements, milking machines and separators, engines, edge-tools, gloves, white lead, pumps, leather belting, grinding wheels, copper rods and electrical transmission cable, office furniture, felt hats, breakfast foods, and condensed milk. Pop. (1911) 9,374; (1921) 10,043.

Brock'way, HOWARD (1870–), American pianist and composer, was born in Brooklyn, N. Y., and studied music and composition in that city, and in Berlin. He began composing at an early age, and his *Sylvan Suite* was given by the Boston Symphony Orchestra in 1901. From 1903 to 1909 he was a member of the faculty of the Peabody Institute of Baltimore, Md. While in Berlin, Professor Brockway gave, with the assistance of the Berlin Philharmonic Orchestra, a concert of his own works, which comprise a large number of pieces for the piano, orchestra, and voice. He is a member of the National Institute of Arts and Letters.

Brockway, ZEBULON REED (1827–1920), American penologist, was born in Lyme, Conn. He gained his first experience in penal work as clerk of the Connecticut State Prison (1848), was made deputy superintendent of the Albany (N. Y.) Penitentiary in 1851, and from 1861 to 1873 took charge of the Detroit House of Correction. He organized the Reformatory at Elmira, N. Y., of which he was superintendent from 1876 to 1900, and there introduced the indeterminate sentence which has had so great an influence in matters of prison reform. He was mayor of Elmira in 1906–7. Consult his *Fifty Years of Prison Service* (autobiographical).

Broderick, brō'd*e*-rik, DAVID COLBRETH (*c.* 1819–59), American political leader, was born in Washington, D. C., the son of a stonecutter. For many years he was a prominent Tammany leader, being identified with the rough and turbulent element of the party. His personal habits, however, were above reproach, and in his spare hours he was an assiduous student, though his early educational opportunities were slight. He was a member of the California constitutional convention (1849), and afterward of the State senate (1850–1), being president of that body in 1851, and was the leader of the anti-Lecompton, anti-slavery, anti-aristocracy faction of the Democratic party in the State. In 1857 he was elected to the U. S. Senate. In 1859 he took part in the bitter campaign between the two Democratic factions in California, and at its close was killed in a duel (Sept. 13, 1859) by Judge Terry.

Brodeur, brō'dėr, LOUIS PHILIPPE (1862–), Canadian jurist, was born in Belœil, Que. He was educated at the college of Ste. Hyacinthe and at Laval University, was called to the bar in 1884, and was created king's counsel in 1889. He was elected to the Canadian Parliament in 1891, appointed its Deputy Speaker in 1896, and Speaker in 1901. In 1904 he became Minister of Inland Revenue, and in 1906 Minister of Marine and Fisheries. He was a Canadian delegate to the Imperial Conferences at London in 1907 and 1911, and one of two plenipotentiaries that negotiated the Franco-Canadian treaty in 1907. He represented Canada at the Imperial Defence Conference in 1909, was put in charge of the newly organized Department of Naval Service in 1910, and was appointed a judge of the Supreme Court of Canada in 1911.

Brod'head, JOHN ROMEYN (1814–73), American historian, was born in Philadelphia, Pa. He was graduated from Rutgers College in 1831, was admitted to the bar in 1835, and practised for a short time in New York, became secretary of the U. S. legation at The Hague in 1839 and in London in 1846 (George Bancroft then being minister). In 1853–7 he was naval officer of the port of New York. He is remembered chiefly as a historian. His *History of the State of New York* (2 vols. 1853–71) is the standard work on the period covered (1609–91). From 1841 to 1845, as the agent of New York, he collected in the archives of Europe historical material of great value, which was published, under the editorship of O'Callaghan (11 vols.) and Fernow (4 vols.), as *Documents Relating to the Colonial History of the State of New York* (15 vols., 1853–83).

Brodie, brō′di, Alexander Oswald (1849–1918), American army officer, was born in St. Lawrence county, N. Y. He was graduated from the U. S. Military Academy in 1865, and became second lieutenant of cavalry in 1870. He resigned from the army in 1877, but re-entered it and served against the Apaches in 1883–4. From 1887 to 1898 he was engaged in mining and civil engineering in the West. During the Spanish-American War he was a member of Roosevelt's 'Rough Riders,' becoming lieutenant-colonel. He was made assistant chief of the Record and Pension Office, with the rank of major, in 1905, and in 1907 was promoted to adjutant-general.

Brodie, Sir Benjamin Collins (1783–1862), British surgeon, was born in Winterslow, Wiltshire. At the age of eighteen he went to London to study medicine, devoting himself particularly to the study of anatomy. Having entered St. George's Hospital in 1803, he was assistant surgeon there in 1808–22, and surgeon in 1822–32. In 1832 William IV. made him sergeant-surgeon and two years later he was created baronet. He also maintained a large and lucrative private practice and was the recipient of many honors, being a fellow of the Royal Society, winner of the Copley medal, and president of the Royal Society and of the Royal College of Surgeons. He was a successful operator, calm and cool, but he was particularly interested in preventive medicine and in diagnosis. His published works include *Diseases of the Joints* (1818) and *Psychological Inquiries* (1854).

Brodie, Sir Benjamin Collins (1817–80), English chemist, son of the eminent surgeon of that name, became professor of chemistry at Oxford (1855), and was president of the Chemical Society (1859–60). His name is associated with researches into the nature of graphite, and of that modified form of carbon present in graphite for which he proposed the name *graphon.*

Brod′rick, St. John, First Earl of Midleton (1856–), British statesman, was educated at Oxford. In 1880 he represented West Surrey as a Conservative and in 1885–1906 was member for Guildford in the same county. In Lord Salisbury's second administration (1886–92) he was financial secretary to the War Office, and in the Union government (1895–1900), was successively under-secretary for war and for foreign affairs. He was secretary of state for war, 1900–02, secretary of state for India, 1903–05, and alderman in the London Council, 1907–13. He was created Earl of Midleton in 1920.

Bro′dy, town, Ukraine, 53 miles by rail northeast of Lemberg. It was a free commercial city from 1779 to 1879. In the Great War it was headquarters of the Second Austro-Hungarian Army from Aug. 14, 1914, to July, 1916, when it was retaken by the Russians. At the Russian revolution it was seized by the Germans. Pop. 18,000, chiefly Jewish.

Brodzinski, brod-zin′ski, Kazimierz (1791–1835), Polish poet, was born in Krolowka, Galicia. He joined the French army (1809), fought in the Russian campaign (1812–13), and was taken prisoner at Leipzig. He was afterward professor of æsthetics at Warsaw University (1822–31) until its suppression. His most important work is the Polish idyll *Wieslaw* (1820). A collected edition of his writings was published in 8 volumes in 1872–4.

Broggerite. See Cleveite.

Broglie, brō′ē-y', the name of a French noble family, originally from Piedmont, among the founders of the city and republic of Chiari, in Lombardy.

François Marie, Duc de (1671–1745), marshal of France, was born in Paris, and between 1689 and 1714 distinguished himself in divers campaigns in Flanders, on the Rhine, and in Italy. From 1724 to 1731 he was ambassador in London. He was created a marshal in 1734, conducted the campaign of Italy (1733), and was commander-in-chief of the French army in Bohemia (1741). In 1742 he was created duke.

Victor François (1718–1804), son of François Marie, was born at Münster, in Westphalia. At an early age he took part in the campaign of Italy under his father, and afterwards fought in Bohemia. In the Seven Years' War he greatly distinguished himself as a French general, took part in the battles of Rossbach (1757), Sondershausen (1758), and Bergen (1759), and for this last victory was made a prince of the empire and marshal of France, as well as commander-in-chief of the French army in Germany. Although victorious at Korbach (1760), he was defeated at Willingshausen (1761). At the beginning of the Revolution Louis XVI. made him minister of war; but he was forced to emigrate to Germany, and commanded the emigrants in Champagne (1792). Afterwards he entered into the service of England (1794) and of Russia (1797).

Charles François, Comte de (1719–81), brother of the preceding, was sent as ambassador to Warsaw in 1752. He combated the growing Russian influence in Poland, and at the same time endeavored to pave the way for the election of the Prince of Conti as king of Poland. He took part in the Seven Years' War under his brother, and distinguished himself at Cassel (1761). After the war he became the head of the so-called secret cabinet of Louis XV. Broglie's activity centred around the prevention of the partition of Poland.

Achille Charles Léonce Victor, Duc de (1785–1870), statesman and author, was born in Paris. In 1809 he was appointed by Napoleon to the Council of State, in which quality he served on several diplomatic missions. In 1816 he married the daughter of Madame de Staël. In 1830 he was a member of the first cabinet of Louis Philippe, in 1832 minister of foreign affairs, and in 1835 premier, negotiating with England the abolition of slavery. After the fall of his government in 1836 he was for a short time (1847–8) ambassador in London. He retired from political life in 1851 and devoted himself to literature, becoming a member of the Academy in 1856. He wrote *Vues sur le gouvernement de la France* (1861), *Ecrits et discours* (3 vols., 1863), *Le libre echange et l'impôt* (1879), and *Souvenirs* (4 vols., 1885–8).

Jacques Victor Albert, Duc de (1821–1901), French statesman and author, eldest son of Louis Philippe's minister of that name. During the Second Empire he produced *Etudes morales et littéraires* (1853), a history of *L'église et l'empire romain au IV. siècle* (1856–69), a searching pamphlet on *The Maladministration of Algeria* (1860), *Souveraineté pontificale et la liberté* (1861), and *La liberté divine et humaine* (1865). In 1871 he was elected to the National Assembly by the department of the Eure, and in the same year was appointed ambassador to London, a post which he resigned in 1872. As leader of the Conservative right centre, he moved the order of the day which led to the resignation of Thiers and the acceptance by Marshal MacMahon of the presidency of the republic. The duke then became minister of foreign affairs and president of the council; but his policy being strongly condemned by Gambetta, he resigned in May, 1874. He was elected to the Senate in 1876, and in the following year formed a royalist and imperialist cabinet in which he became president of the council and minister of justice. By various reactionary measures he again sought to overthrow the republic; but Gambetta forced him to resign. The last twenty-five years of his life were chiefly occupied in historical writing, his more important works being notably *Le secret du roi* (1878), a valuable collection of state papers relating to the reign of Louis XV., and memoirs of Frederick II. (1882–4), Maria Theresa (1882–8), his father (1886), and Talleyrand (1891).

Broiling. See COOKERY.

Broke, SIR PHILIP BOWES VERE (1776–1841), British naval officer, was born in Broke Hall, near Ipswich. He entered the navy at the age of twelve and in 1792 was appointed to the *Bulldog* sloop under Captain Hope. Having participated in the siege of Bastia, the actions off Toulon, the action off Cape St. Vincent, and in convoy service with the North Sea Fleet, he was appointed in 1806 to the *Shannon*. In this command he patrolled the coast of Spitzbergen, cruised about in the Bay of Biscay, and in 1813 was sent to the United States, where he fought a successful battle with the American frigate *Chesapeake*. He was so severely wounded that further active service was inadvisable. He was created baronet in 1813 and K.C.B. in 1815, attaining the rank of rear-admiral in 1830.

Broken Hill, town, New South Wales, Australia, 925 miles west of Sydney. It has the most prolific silver mines in the world (the Proprietary). Pop. (1924) 23,140.

Broken Wind. See HORSE: *Diseases.*

Broker, primarily an agent employed to negotiate purchases or sales of goods or other property. Unlike a factor, a broker does not have possession of the property to which his employment relates, but acts only as a middleman between the real parties to the transaction. For this reason he can neither sue nor be sued with respect to the contracts into which, as broker, he enters. Where he acts for a named principal, no personal liability attaches to him; and even where his principal is unnamed, he is only liable if there is a custom in the particular trade imposing this liability upon him. If, however, a broker, although in reality acting as an agent, does not purport to do so, personal liability attaches to him. He has an implied authority to buy and sell according to the custom of the market in which he deals. He is entitled to the customary remuneration for the work he performs, and to be indemnified by his principal against all liability properly incurred by him. The term broker is employed in a secondary sense and by analogy to describe persons employed in certain negotiations which do not involve the sale of property, as insurance brokers, who are employed as agents by persons who desire to procure insurance; ship brokers, who, in addition to the buying and selling of ships or shares or interests therein, also carry on the business of chartering vessels or of procuring contracts of freightage. See PRINCIPAL AND AGENT; PAWNBROKER.

Bromberg (Pol. *Bydgoszcz*), brom'ber*ch*, town, Poland, in Posen, about 7 miles from the Vistula; 140 miles northwest of Warsaw. The town owes its importance to the canal constructed by Frederick the Great in 1773–4, which connects the Oder and the Elbe with the Vistula. It has an active trade in coal, wool, leather, and flour, and there are manufactures of paper, machinery, vehicles, soap, and beer.

Bromberg became part of Prussia at the division of Poland in 1772, but was restored to Poland at the close of the Great War. Pop. (1921) 87,643.

Brome, RICHARD (d. 1652), British dramatist, was probably of humble birth. In 1614 he was 'man' or servant to Ben Jonson. He took to dramatic writing, collaborating with the younger Jonson in a lost comedy, *A Fault in Friendship* (1623), and with Thomas Heywood in *The Late Lancashire Witches* (1634). Of his independent plays, which include romantic and real life comedies, *The Northern Lass* (1632), *The Antipodes* (1640), and *A Jovial Crew* (1652), are the best known. His *Collected Works* were edited by Pearson (1873).

Brome Grass, a genus of annual or perennial grasses found chiefly in the north temperate zone. They grow to from 2 to 5 feet in height, bearing panicles of large spikelets. The genus contains a few forage grasses and many troublesome weeds. Among the more important of the forage species are *Bromus inermis*, an erect annual used as a meadow and pasture grass in the Northwestern States; it is quite resistant to drought and is especially valuable in semi-arid regions; and *B. unioloides* grown in the Southern States for forage. The weedy annual species include *B. secalinus*, or cheat; *B. commutatus*, *B. mollis*, and *B. rubens*. *B. madritensis*, a native of Europe, is sometimes cultivated for ornamental purposes.

Bromeliaceæ, brō-mel-i-ā'si-e, the PINEAPPLE FAMILY. A natural order of monocotyledonous plants, entirely confined to America, and abounding chiefly in the tropical and southern portions of that continent. Nearly all of the numerous species are herbaceous plants, with short stems crowned by rosettes of long, leathery leaves, which not infrequently exhibit a grayish appearance, owing to the small hairs with which they are clothed. The flowers are borne on terminal spikes, and are often large and brightly colored, though without scent. Many of the species are epiphytic, and attach themselves to tall trees by means of aërial roots, without, however, obtaining from them any food material. Such, for example, is the Spanish moss of the warmer portions of America (*Tillandsia usneoides*), widely known for its trailing gray stems, especially luxuriant on the live-oaks. It is frequently employed as a substitute for horsehair in stuffing cushions. A number of species also grow in clefts on rock faces, where there is little or no soil; while others, like the pineapple (*Ananas sativa*), root in the usual manner. Several fibres, as the pineapple and pita, are derived from plants of this family.

Bromide. See BROMINE.

Bro'mine (Br, 79.92) is an element of the halogen group, and has been known since 1826, but was not prepared in any quantity until 1860. It is present in traces in sea-water, but is usually obtained from the mother liquor of the Stassfurt potash beds, in which it is present as magnesium bromide, or from American brines, particularly in Michigan and West Virginia. The bromine, which is present to the extent of about 0.25 per cent. in the liquor, is displaced by chlorine, either produced separately and added to the bromide solution, or prepared along with bromine electrolytically, or by the action of sulphuric acid and manganese dioxide on the chloride of magnesium present. The former plan is the better, as it can be worked continuously, and is carried out by making the liquor trickle down a tower packed with earthenware balls, where it meets a mixture of steam and chlorine that is passed up. As a consequence bromine is displaced ($MgBr_2 + Cl_2 = MgCl_2 + Br_2$), and passes out in vapor at the top of the tower into a worm surrounded by cold water, by which it is condensed to the liquid form and collected.

Bromine is a heavy (sp. gr. 3.2), mobile, reddish-brown liquid; it is the only liquid non-metallic element. It boils at 59° C., and gives off a dark-red gas; also readily volatilizing at ordinary temperatures. The gas has a strong, disagreeable odor, similar to that of chlorine, and has a most irritating effect on the eyes. It is somewhat soluble in water, and readily so in carbon disulphide, forming in both cases a red solution.

Chemically, bromine is less active than chlorine, but more so than iodine. Thus, it unites with hydrogen to form hydrogen bromide when the mixture of gases is set on fire, or if heated and exposed to light, forming a fuming gas (see HYDROBROMIC ACID). It also unites vigorously with most metals, phosphorus, sulphur, etc., and has some bleaching action. It produces painful sores if spilled on the skin, and has been used—though not to a great extent on account of expense—as a disinfectant. It is chiefly employed for the preparation of its compounds, which are largely used in photography and medicine, in the manufacture of coal-tar dyes, etc.

During the World War large quantities of bromine were used in the preparation of chemical warfare gases, particularly tear gas, and since that time large quantities are being required in the manufacture of tetraethyl lead for use in motor fuel. For this last use, a method of recovering it from sea water was devised, but details of this process have not yet been made public.

The production of bromine in the United States in 1925 amounted to 1,566,130 pounds, valued at $488,406.

The bromides chiefly used in medicine are those of potassium, sodium, and ammonium. The average dose of each is from five to thirty grains. Bromides are powerful depressants of the nervous system, and hypnotics. They affect the circulation by lessening the force and frequency of the heart-beat. Toxic doses produce a fall of temperature. They are largely used in nervous diseases for their sedative and hypnotic effect, and are among the most valuable drugs known for the treatment of epilepsy. Large doses are used, in combination with chloral, for delirium tremens. If bromides are taken for too long a time, symptoms of poisoning, called 'bromism,' may appear. The first symptom is a rash of red acne-like papules on the face and back, next a lowering of the sensitiveness of the skin, then a diminution of sexual power. The individual becomes low-spirited; his intellect is dulled, and in bad cases dementia, melancholia, and other mental disorders may develop.

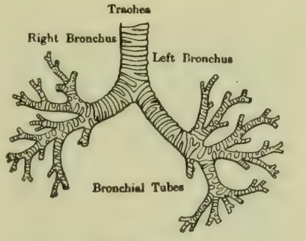
Bromley, brum'li, town, England, in Kent, 10 miles southeast of London. It is the home of Bromley College, an almshouse for clergymen's widows, founded in 1666. In the nave of the parish church lies the body of Samuel Johnson's wife. Bromley was for centuries the residence of the Bishops of Rochester. Pop. (1911) 33,649; (1921) 35,070.

Bro'moform ($CHBr_3$) is the bromine analogue of chloroform. It is prepared by similar methods to chloroform, and is a very heavy liquid (sp. gr. 2.8), which is insoluble in water, and turns red in the light from separation of bromine. It is used as a heavy liquid, for separating and determining the density of minerals, and also to a slight extent in medicine.

Bromsgrove, brumz'grōv, town, England, in Worcestershire, 13 miles southwest of Birmingham. There are many quaint gabled houses and a fine Perpendicular church. The chief industries are the manufacture of nails, cloth, and buttons, and the Midland Railway Company works. Pop. (1911) 8,928; (1921) 9,449.

Bromwich. See WEST BROMWICH.

Bronchi, brong'kī, the two primary divisions of the trachea (q.v.) or windpipe, leading to the right and left lung respectively. The right bronchus is about one inch in length, and the left nearly two inches long. The bronchi are tubes of fibro-elastic membrane, within the layers of which are embedded series of cartilaginous rings, which go around about two-thirds of their circumference, the interval between the rings being bridged over by the fibrous membrane in which they are enclosed. Within the tube, at the back, is a layer of unstriped muscular fibres, which extend transversely between the cartilaginous rings to which they are attached. Outside these are a few longitudinal bundles; and beneath the mucous membrane is a distinct layer of unstriped muscle, the *muscularis mucosæ.* Lining the tube is the mucous membrane, covered with ciliated epithelium. On entering the lungs the bronchi divide and subdivide into smaller branches or bronchioles, which penetrate into every part, until at length they end in the small subdivisions of the lungs called lobules. As the subdivisions become smaller and their walls thinner, the cartilaginous rings become scarcer and more irregular, until they are represented only by minute and scattered cartilaginous flakes.



The Bronchi

Foreign bodies sometimes lodge in the bronchi producing more or less complete obstruction. They may be located and removed by means of the bronchoscope, similar in principle to the speculum.

For diseases of the bronchi, see BRONCHIECTASIS; BRONCHITIS. See also LUNGS.

Bronchiecta'sis, dilatation of the bronchial tubes associated with inflammatory changes in the mucous membrane and thickening or thinning of the bronchial walls. If the condition occurs in the dependent parts of the lungs, there is excessive secretion which tends to accumulate in the dilated portions and may be of a very fetid odor. Various bacterial organisms are associated with the condition, notably *B. influenzæ* and *Streptococcus hemolyticus.* The disease may also follow the inhalation of irritant gases. Acute, chronic, and congenital forms occur. The chronic type, which is by far the most frequent, is permanent, and recovery seldom occurs, though death may be postponed for years. Treatment is purely symptomatic, being directed chiefly toward reducing the sputum, facilitating its expulsion (by drugs and posture), and removing the foul odor. The inhalation of medicated vapor is recommended.

Bronchi'tis, inflammation of the mucous membrane of the bronchial tubes, may be acute or chronic.

Acute bronchitis is one of the commonest of respiratory diseases. It may occur independently or as an accompaniment of some other acute infectious disease. It is particularly prevalent in the changeable weather encountered during the spring and late fall. The principal symptoms are cough, slight fever, and in the later stages profuse mucopurulent or purulent sputum. The disease is usually comparatively harmless, but in the aged and in very young children the inflammation may extend into the finer bronchi, producing broncho-pneumonia. Treatment includes such simple measures as a hot foot bath, Dover's powder or hot lemonade, counter irritation to the chest (mustard plasters), and the use of expectorants.

Chronic bronchitis is usually associated with some pulmonary condition. It occurs most frequently in persons beyond middle life and is seen more often in the winter than in the summer. Removal to a favorable climate is advisable.

Special forms of bronchitis are spirochetal bronchitis, a markedly contagious condition seen in the tropics, in which spirochetes appear in the sputum in large numbers, and fibrinous, plastic, croupous, or pseudo-membranous bronchitis characterized by the formation in the bronchi of casts moulded to the shape of the tubes. The prognosis is favorable in both conditions.

Bronchocele. See Goitre.

Bronchoph'ony, the sound of the voice when heard through the stethoscope, applied over a healthy bronchus. Heard elsewhere it indicates consolidation of lung tissue — *i. e.* pneumonia. The sound is as if the patient were speaking directly into the stethoscope.

Bronchopneumonia. See Pneumonia.

Brondsted, brûn'sted, Peter Olaf (1780–1842), Danish archæologist and traveller, was born in Fruering, Aarhus. He was educated in the University of Copenhagen and in 1806 in company with his friend Dr. Koes went to Paris in order to prepare for a trip to Greece to explore its treasures. The trip was undertaken in 1810 and excavations in Ægina and in Phigalia provided substantial aid for classical study. He returned to Copenhagen in 1813 and was appointed professor in philology. In 1818 he visited Rome as envoy to the Vatican and in 1820 went to Sicily, Malta, and the Ionian Islands. He was professor of philology and archæology at the University of Copenhagen in 1832–41 and in the latter year became its rector. His principal work was *Travels and Researches in Greece* (1826–30); other works include *Contribution to Danish History from Foreign MS Collections* (1817–8); *An Account of Some Greek Vases found near Vulci* (1832); *On the Bronzes from Siris* (1836–7); a metrical translation of the *Agamemnon* of Æschylus (1837).

Brongniart, brôn'-nyär', Adolphe Theophile (1801–76), French botanist, son of Alexandre Brongniart, studied medicine but devoted himself to the study of botany, particularly vegetable fossils, and the development of pollen. He was professor of botany at the Jardin des Plantes. His principal work is *Histoire des végétaux fossiles* (1828–37).

Brongniart, Alexandre (1770–1847), French naturalist, mineralogist, and geologist, the friend of Cuvier, was born in Paris. After serving as druggist in the army, and as mining engineer, in 1800 he became director of the Sèvres porcelain manufactory, where he perfected the art of painting on glass. In 1822 he was appointed professor of mineralogy in the Paris Museum of Natural History. Among his numerous works were studies on the geology of the environs of Paris (with Cuvier, 1811; 3d ed. 1835); on the geology of the Apennines and Alps (1821–2), and of Sweden (1828); *Tableau des terrains qui composent l'ecorce du globe* (1829); and *Traité des arts céramiques et des poteries* (1844; 2d ed. 1854).

Bronn, Heinrich Georg (1800–62), German naturalist and botanist, was born in Ziegelhausen, near Heidelberg, and in 1828 became professor of natural history and director of the zoological collections of Heidelberg University. Of his numerous writings, which are mainly geological, the chief are *Lethæ Geognostica* (1836–8; new ed. 1876), *Geschichte der Natur* (1841–9), and *Allgemeine Zoologie* (1850).

Bronte, bron-tā', town, Sicily, in the province of Catania, on the west slope (2,600 ft.) of Mt. Etna, 32 miles northwest of Catania, is surrounded by chilled lava-flows. It gave its name to the dukedom bestowed on Nelson by Ferdinand IV. Pop. (1921) 16,655.

Brontë, Charlotte (1816–55), celebrated English novelist, daughter of Patrick Brontë, rector of Haworth, near Keighley, was born in Thornton, April 21, 1816. Her mother died when Charlotte was about six years old, and she, her brother Branwell, and her sisters Emily and Anne were cared for by their father, a somewhat solitary and eccentric man, and their aunt, Miss Branwell. In 1824 the girls were sent for a short time to the Clergy Daughters' School at Cowan Bridge, but an epidemic of typhus fever caused their withdrawal. After an interval of seven years spent at home, roaming the moors, and engaging in household duties, Charlotte went in 1831 to Miss Wooler's school in Roe Head, where two years later she became a teacher. She followed the school on its removal to Dewsbury Moor and later found employment as a governess, first at Stonegappe, then at Rawdon. She was, however, quite unfitted by temperament for such environment, and in 1842 persuaded her aunt to advance the money to allow her and Emily to study at Madame Héger's school in Brussels, thus better fitting themselves for teaching. In 1844 Charlotte returned to Haworth, Emily having preceded her two years earlier, after only a few months abroad.

Charlotte Brontë

The remainder of her life Charlotte spent at Haworth, engaged in family duties and in writing. Many griefs saddened these years. Her brother Branwell, who had become an inebriate, died in September, 1848, and in December of the same year Emily passed away, to be followed in the spring of 1849 by Anne. In 1854 Charlotte married Rev. Arthur Nicholls, her father's curate, and after a brief period of happiness, died March 31, 1855.

The first of Charlotte Brontë's literary work to be published was included in a collection of *Poems* by the three sisters, which appeared under the pseudonym Currer, Ellis, and Acton Bell, in 1846. This Charlotte followed by *The Professor*, which could find no publisher, but was the occasion of a request for a longer novel, forthcoming in 1847 as *Jane Eyre*. *Jane Eyre* was an instant success, and completely altered the trend of its author's life, for it brought her into correspondence with Smith Williams, George Smith, Thackeray, Miss Martineau, and other people well known in the literary world.

In September, 1849, Charlotte completed *Shirley*, which was published in the following month. Personal reputation and association with her literary equals now came to the novelist. She met Thackeray in London, visited Harriet Martineau at Ambleside, corresponded with George Henry Lewes and others, and sat for her portrait to Richmond. In the following year she was again in London for the Great Exhibition. In 1852 she was occupied with *Villette*, her last novel, which appeared the following year. *The Professor*, her first novel, was published after her death, with a brief introductory note by her husband.

The Brontë family were all extremely gifted. Branwell (1817–48) was an artist of ability and left a few poems evincing some little talent, but his life was a tragedy and he met an early death. Anne (1820–49), the youngest of the family, was a gentle soul, without the fire of genius which burned in the breast of Charlotte and Emily, though her two stories *Agnes Grey* (1847) and *The Tenant of Wildfell Hall* (1848) show unmistakable evidence of talent and imagination. For EMILY, see BRONTË, EMILY.

A list of the various books that have been published on the Brontës is given in the Haworth edition of Mrs. Gaskell's *Life of Charlotte Brontë* (1857), an acknowledged classic, particularly valuable for its footnotes. Supplemental biographical material may be found in *Charlotte Brontë and her Circle* by Clement Shorter; *The Father of the Brontës* by W. W. Yates; *The Three Brontës* by May Sinclair (1912). Madame Duclaux, under her maiden name of A. M. F. Robinson, contributed a biography of Emily Brontë to the 'Eminent Women Series' (1883).

Brontë, EMILY (1818–48), the fifth child of Patrick and Maria Brontë, was born in Haworth. She was only four years old when her mother died and in 1824 was sent with her sisters to the Clergy Daughters' School at Cowan Bridge where she remained but a short time. In 1835 she was for a brief period at Miss Wooler's school at Roe Head, where Charlotte was a teacher, and in 1842 spent a few months with Charlotte at Madame Héger's school in Brussels. The few remaining years of her life were passed in Haworth. Aside from her poems, published with those of her sisters in the collection of *Poems* by Currer, Ellis, and Acton Bell, her only work is *Wuthering Heights* (1847), a novel extraordinary in its portrayal of vehement passion and grief. The story itself is badly constructed but the drawing of the characters is masterly, the style is faultless, and the author's dramatic instinct never fails. In her lifetime the supreme genius of Emily Brontë was unrecognized and her book was even believed to be an earlier work of Charlotte's, but after many years it has been accorded recognition as the supreme work of these gifted sisters.

Brontosau'rus, a huge dinosaur belonging to the order *Sauropoda*. Fossil remains have been found in the Upper Jurassic strata of Wyoming and indicate a creature 60 feet long and about 10 feet high, with an extremely small head. The trunk was short and thick and its neck long and slender, probably enabling the animal to feed on the upper parts of aquatic plants among which it lived. The equal length of the limbs show that the creature walked on all fours.

Brontotheriidæ, bron-tō-the-rī'i-dē, gigantic extinct ungulate animals, the remains of which have been found principally in North America. They occur in Eocene and Miocene strata, and indicate an animal intermediate in size between an elephant and a rhinoceros. From the shape of the skull it is probable that they had a long, flexible nose, though not a true prehensile proboscis. The type genus of the family is known as Titanotherium. Consult Hutchinson's *Extinct Monsters;* Woodward's *Vertebrate Palæontology*.

Bronx, THE, since 1898 one of the five boroughs of New York City. It lies north of Manhattan, between the East River and Long Island Sound on the east and southeast, and the Harlem River and Hudson River on the west and southwest; area, 26,524 acres; pop. (1926) 900,198. It takes its name from the Bronx River, a small stream emptying into the East River. Bronx Park contains important botanical and zoölogical gardens. See NEW YORK.

Bronze, an alloy of copper. Usually, it contains copper, 80 to 90 per cent., and tin, 20 to 10 per cent.: the tin may be partly replaced by lead and zinc. Bronze was one of the chief metals of antiquity. In modern times it has been used for the manufacture of cannon, though for this purpose it is now superseded by steel; for coins; as bell metal, on account of its resonance; and for casts of statues, busts, etc., because of its fine color both when clean and when oxidized by the weather.

The term bronze has been broadened in modern practice to apply to a large class of metals consisting essentially of copper which by the absorption of other metals has become stronger and harder and capable of being cast. Thus there are now the important aluminum and manganese bronzes and a number of other alloys whose chief constituent is copper. *Phosphor bronze*, much used for the working parts of machines and for telephone wires, contains about one-fifth per cent. of phosphorus, which greatly increases its hardness and tenacity. The use of the term bronze without qualification refers to the copper-tin alloy; when it applies to other alloys the name of the constituent replacing tin is invariably prefixed.

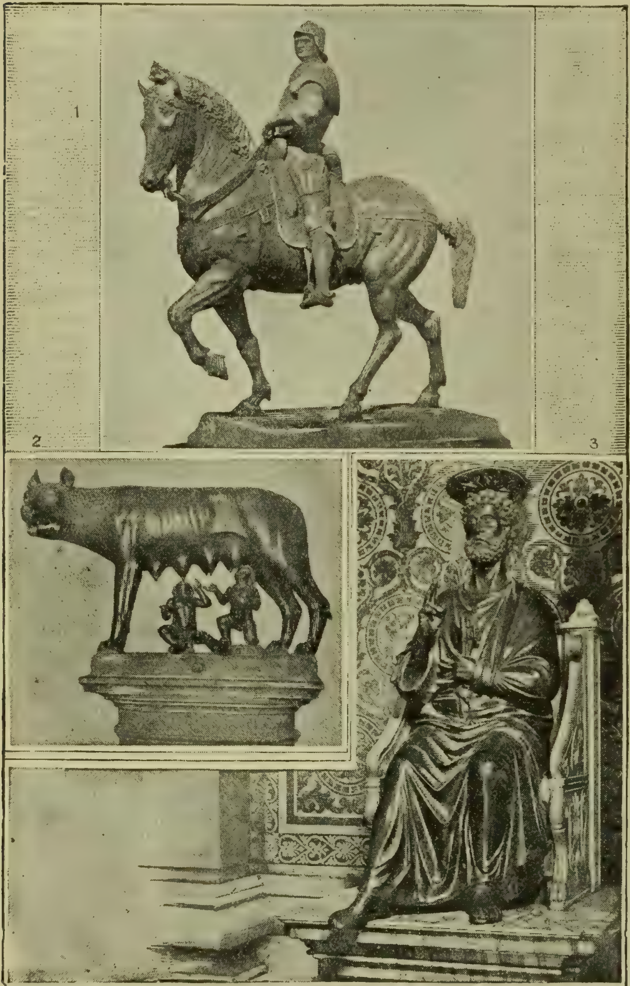
Bronze Age, a term applied to the second of three periods, *i.e.* Stone Age, Bronze Age, Iron Age, into which it has been convenient to divide the history of early man. This division holds good to a certain extent for both time and culture, though there is, of course, no fixed moment when any race ceased to use stone, and learned to use bronze, implements. The dates generally assigned to the period are 2500 to 1800 B.C., but these cannot be accepted as definite, for in some areas this stage of culture may have been reached earlier, in others later, while in some it may have been prolonged, and in others brief, or even, as in the Polynesian area, nonexistent in consequence of the people passing directly from the use of stone to that of iron. A Bronze-Age people in one region may thus have been contemporary with a Stone-Age people in another, and with an Iron-Age people in a third; that is to say, the succession of the three ages was not necessarily synchronous, either in contiguous or in widely separated areas. The Homeric poems depict the culture of a people passing from the use of bronze to that of iron. The Mexicans and Peruvians, on the other hand, were still in their bronze age in recent times.

In Europe, Bronze-Age culture falls into two divisions, the north and the south. The Bronze Age of Northern Europe may be divided into four periods, in the first of which bronze occurs but copper is often used, and in the last three of which bronze is common and tools and objects fashioned of bronze show great excellence. In Southern Europe the Bronze-Age degree of culture is best classified by means of its pottery, more carefully prepared and more ornate than that of the Stone Age.

The commonest and most characteristic objects belonging to the Bronze Age are the 'celts,' probably used for hoes, chisels, war-axes, and similar purposes (see CELT). Other common objects are spears, swords, knives, shields, daggers, and articles of personal adornment. The forms of each class differ in different areas, and vary with advancing time. Blades and axes, which were at first made with tangs to be inserted in the handles, became socketed for the insertion of the handles; and articles which it was at first the custom to finish in the mould were finished with the hammer, while shields, and vessels made of hammered plates were ornamented with chasing and repoussé work. The ornamentation of the Bronze Age consists chiefly of concentric circles, spirals, and bosses. The workmanship is of a high order, the shapes graceful, and the finish fine. The moulds used for casting were of stone or bronze or clay. The system of coring was carried to great perfection, and many of the more difficult castings were turned out in a manner that would do credit to the most expert of modern workmen.

Various theories have been advanced as to the origin of the Bronze Age. Some authorities attribute the introduction of bronze as due to Roman influence, others to the Etruscans, still others to the Phœnicians and, perhaps the largest number of all, to the Indo-Europeans, who overran Europe from the East.

Consult Avebury's *Prehistoric Times;* Evans' *Ancient Bronze Implements of Great Britain;* Quennell's *The New Stone, Bronze and Early Iron Age* (1923); Burkett's *Prehistory* (1925).



Bronze Statuary

1. Equestrian Statue of Bartolomeo Colleoni, Venice. 2. The Wolf of the Capitol, Rome. 3. Statue of St. Peter, Rome.

Bronzes, representations of objects and figures produced in bronze. This form of art has existed from very early times. During a period of several thousand years, known as the Bronze Age (q.v.), man's tools and other implements were made of bronze, a fact which plays an important part in the dating of prehistoric tombs. Bronze was also a favorite material with Greek sculptors, at least until the 4th century B.C., and in the 5th century A.D. the number of bronze statues in Rome was said to exceed 3,500. The great majority of these Greek and Roman bronze statues have disappeared, for the obvious reason that they were of intrinsic value and comparatively easy of transportation. The Romans despoiled Greece to beautify their own cities, and the barbarians, sweeping down on Italy, melted the bronze statues for the metal.

The difference between the bronzes of classical period and those of the Renaissance and modern times is chiefly one of conception and style. Greek work is impersonal, while in Renaissance and modern sculpture there is often an element of individuality and intimacy. The earliest Greek statues in bronze were apparently made by hammering the metal into thin plates which were joined by rivets, but this method was soon abandoned in favor of casting (q.v.).

The Renaissance witnessed a marvellous revival of art in bronze as exemplified in the works of Donatello, Ghiberti, Cellini, Brunelleschi, Verrochio, and others. Among the most celebrated specimens of their work are the bronze doors of the Baptistery in Florence, the Perseus in the Loggio dei Lanzi in Florence, John the Baptist, in the Ashmolean Museum, Oxford, and Donatello's David. Notable artists in bronze in Germany were members of the Vischer family, Peter, Paul, and Hans; in the Netherlands, Duquesnay, de Vries, and Ruysbrack; in France, Pilon, Goujou, Girardon, Houdon, Keller, and Rodin; in England, Gibbons, Prest, Francis Bird, and P. J. Mene. Prominent among American workers in bronze are MacMonies, Bartlett, and Saint Gaudens.

Besides sculptural works, collections of bronzes, of which there are many, both public and private, contain implements and utensils of all periods. The Metropolitan Museum in New York City possesses one of the best collections of ancient bronzes in the world. Among its most conspicuous treasures is an Etruscan chariot found at Monteleone, dating from the middle of the 6th century B.C. It is the only complete ancient bronze chariot so far known. A statuette of a standing girl is one of the finest Etruscan figures in existence.

The East Indians, Chinese, and Japanese have handed down many fine examples of bronze work, notably statues of Buddha. The famous bronze *Wolf of the Capitol* at Rome is ascribed to an Etruscan artist and the bronze horses of St. Mark's, Venice, are said to have been brought from Corinth.

Consult Bode's *The Italian Bronze Statuettes of the Renaissance;* Litchfield's *Antiques: Genuine and Spurious* (1921).

Bronzewing, a name applied to certain Australian ground-pigeons in which the wings show metallic spots and patches. The best-known species is *Phaps chalcoptera.* See PIGEON.

Bronzing, the process of giving a metallic or iridescent appearance to metal and other articles either by the application of a chemical bronzing solution or by dusting bronze powder on a surface previously prepared by coating with linseed-oil varnish. There are several bronzing solutions in use. The article to be bronzed must be first cleaned by washing with strong acids or potash before immersing in the chemical solution or otherwise applying it. Bronzing-machines are used for varnishing, dusting with bronze powder, and finishing the surfaces of wall-papers, fabrics, labels, etc.

Bronzino, Il (1502–72), the name given to Angelo di Cosimo, Italian painter of the Florentine school in its decline, was the favorite pupil of Pontormo and friend of Vasari. His reputation rests on his careful portraits of prominent Florentines of his day. Perhaps his best-known work, *Christ's Descent into Hell* (Uffizi, Florence), influenced by Michael Angelo's *Last Judgment*, is artificial and crowded in arrangement. The portraits of Piero and Cosimo di Medici, of a boy, of a lady, and of a knight of St. Stephen, as well as the allegory *Venus, Cupid, Folly, and Time*, are in the National Gallery, London, and a fine portrait of Eleonora di Toledo is in the Wallace Collection, London. See Ruskin's *Modern Painters;* Sir E. J. Poynter's *Classic and Italian Painting* (1880).

Bronzite, so called from its sub-metallic lustre resembling tarnished bronze, is one of the pyroxenes, belonging to the subdivision which crystallize in the orthorhombic system. It is a fairly common ingredient of igneous rocks. (See Hypersthene.) Its lustre is due to the reflection of light from the surface of minute metallic enclosures.

Brooch, an ornament fastened to clothing by a safety-pin. Several types are distinguished: the Roman bow-shaped *fibula* of various metals; the Celtic, usually of bronze, exhibiting extraordinary knowledge of metal-work, and rare taste in the application of zoomorphic decoration and enamelling; the Viking type, an oval, bowl-shaped brooch with vaguely zoomorphic decoration, cut out of the solid bronze; the Scottish Highland, consisting of large flat bands of metal ornamented with grouped designs of interlaced and scroll patterns; and the Luckenbooth, usually small, heart-shaped, in copper, silver, and gold fancifully set with gems. Of more general mediæval forms may be mentioned the great clan brooches of precious metals set with crystal spheres and jewels, and the small gold brooches frequently inscribed with mottoes in French black-letter. See J. Anderson's *Scotland in Pagan Times* (1881), and *Scotland in Early Christian Times* (1881).

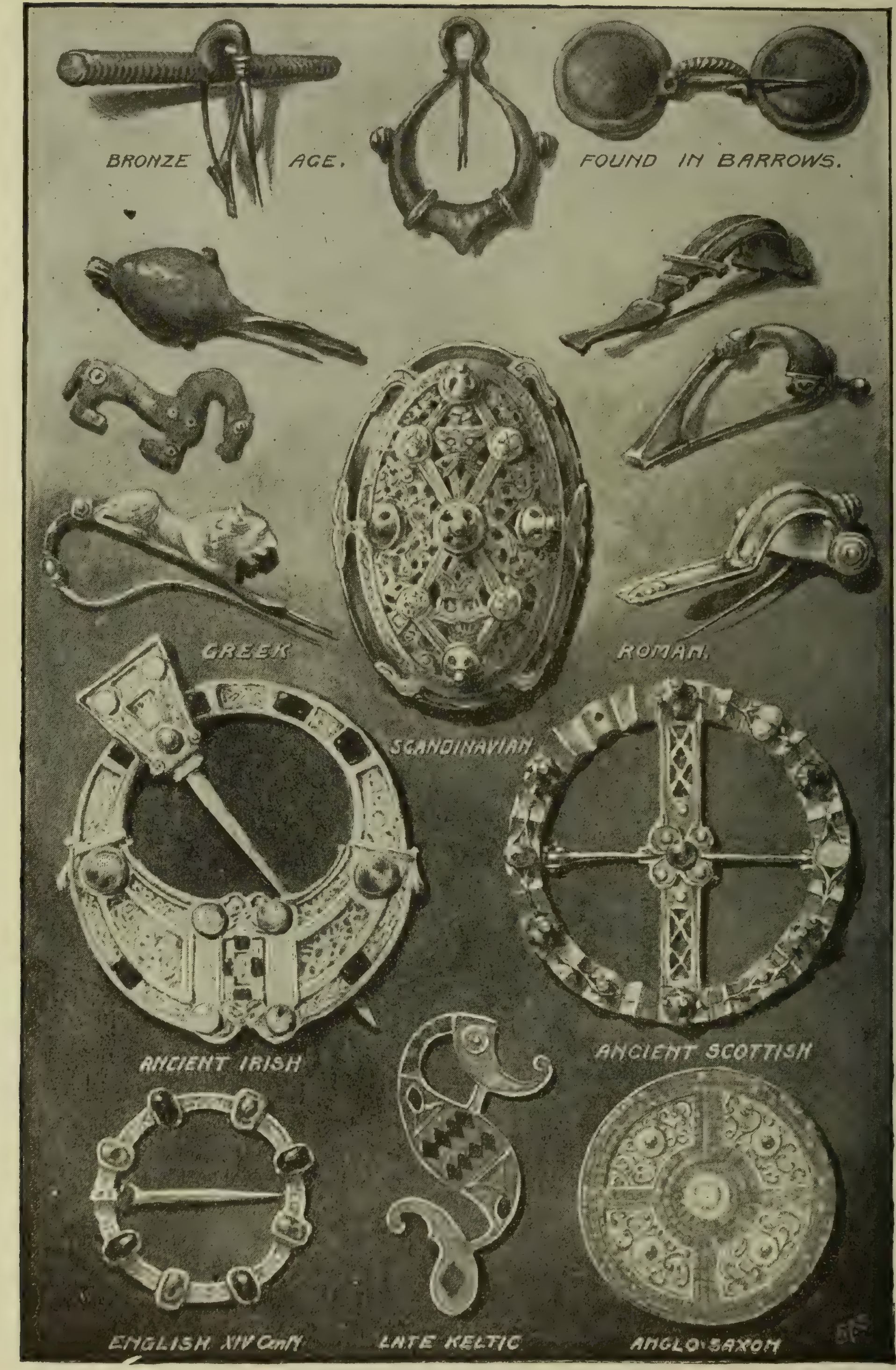
Brooke, Henry (?1703–83), Irish author, published his first work—*Universal Beauty*, a poem—in 1735. He wrote several tragedies—*e. g. Gustavus Vasa* (1739), suppressed on account of political allusions in London, but afterwards given in Dublin as *The Patriot*, the *Earl of Westmoreland* (1745), and the *Earl of Essex* (1749). Though anti-Catholic in his views, Brooke wrote a *Tryal of the Cause of the Roman Catholics* (1761), advocating a mitigation of the penal laws. A project of his, about 1743, to publish a work entitled *Ogygian Tales*, concerned with old Irish legends, resulted in the fragment *Conrade*, written in a style closely resembling Macpherson's *Ossian*. Brooke's novel, *The Fool of Quality*, was highly thought of by Charles Kingsley, who republished it in 1859.

Brooke, Sir James (1803–68), the son of a Devonshire gentleman, but best known as the Rajah of Sarawak, was born at Benares. In 1819 he entered the E. India Company's army, and was seriously wounded in the Burmese War of 1826. Proceeding to Borneo in 1838, he aided the sultan of Brunei to reduce the marauding Dyak tribes of Sarawak, and with such success that the sultan created him rajah of the province of Sarawak in 1841. The island of Labuan, near Sarawak, having been purchased from Borneo by the British government, Brooke, who had been knighted in 1847, was appointed governor of the island and consul-general to Borneo. His subsequent suppression of the pirates was so severe that he was attacked in the House of Commons in 1857, but exonerated; and finally the independence of Sarawak was recognized (1847) by the British government. Brooke died at Burrator, Devonshire—an estate purchased for him by public subscription — June 11, 1868. He was a fine specimen of the old type of Elizabethan adventurers, so far as that type can be reproduced in a later age. See Temple's *Private Letters of Sir James Brooke* (1853); Mundy's (1843) and Keppel's (1845) *Journals;* Jacob's *Raja of Sarawak* (1876); and St. John's *Life of Sir James Brooke* (1879). James Brooke was succeeded by his nephew, Sir Charles Johnson Brooke (*b.* 1829), who rules over a larger territory than his uncle—the Limbang River district having been annexed in 1890, and an earlier accession having been made in 1885.

Brooke, John Rutter (1838), American soldier, was born in Pottsville, Montgomery co., Pa., and began his service in the Army of the Potomac, April, 1861), as captain in the 4th Pennsylvania infantry. He participated in all the army's leading battles during the Civil War, except when disabled by wounds, and was brevetted brigadier-general of volunteers for gallantry. He entered the regular army (July, 1866), in which he was appointed brigadier-general (1888), and saw general service until the beginning of the Spanish War, in which he had command of a separate portion of the Porto Rico expedition, having been made major-general (May, 1898). Gen. Brooke captured Guayama, Aug. 5, 1898, occupied smaller towns, and had formed his troops in line for a battle with the Spaniards when he received notice of the signing of the peace protocol. He was military governor of Porto Rico, and subsequently governor-general of Cuba; and was in command of the department of the East from 1900 until his retirement in 1902.

Brooke, Stopford Augustus (1832), Irish man of letters, became minister of St. James's Chapel, York Street, London, in 1866, and was appointed a chaplain-in-ordinary to Queen Victoria (1872); but in 1880 he seceded from the English Church, owing to his scepticism in regard to the doctrine of the incarnation, and became a Unitarian. He has written *Life and Letters of the late Frederick W. Robertson* (1865); *Sermons*, collected in 4 vols. (1868–77); *Theology in the Eng. Poets* (1874); *Primer of Eng. Lit.* (1876), a wonderful little book; *Riquet of the Tuft: a Love Drama* (1880); *Poems* (1888); *Hist. of Early Eng. Lit.* (1892); *Study of Tennyson* (1894); *Life and Writings of Milton* (Primers of Eng. Lit., 1898); *Early Eng. Lit.*, in Macmillan's series, uniform with Saintsbury's *Elizabethan Lit.* (1899); *Study of Browning* (1901).

Brook Farm, a farm in West Roxbury, Mass., about 10 m. s.w. of Boston, the scene of the most famous of American socialistic experiments, originally an outgrowth or expression of the philosophical and humanitarian movement in New England known as Transcendentalism. A little colony of idealists, under the leadership of George Ripley, was established here in 1841, its official name being 'The Brook Farm Institute for Agriculture and Education,' whose objects, as officially expressed, were 'To more effectually promote the great purposes of human culture; to establish the external relations of life on a basis of wisdom and purity; to apply the principles of justice and love to our social or-



ANCIENT FORMS OF BROOCHES.

ganization in accordance with the laws of Divine Providence; to substitute a system of brotherly co-operation for one of selfish competition; to secure for our children, and for those who may be entrusted to our care, the benefits of the highest physical, intellectual, and moral education which, in the present state of human knowledge, the resources at our command will permit; to institute an attractive, efficient, and productive system of industry; to prevent the exercise of worldly anxiety by the competent supply of our necessary wants; to diminish the desire of excessive accumulation by making the acquisition of individual property subservient to upright and disinterested uses; to guarantee to each other the means of physical support and of spiritual progress, and thus to impart a greater freedom, truthfulness, refinement, and moral dignity to our mode of life.' The employment of the members was to be determined by their respective aptitudes and capacities, and all kinds of labor were to be paid for equally.

The experiment, as at first organized, met with moderate financial success; the membership had increased by 1844 to seventy; and the school was particularly successful, attracting as students men who later became well known, as George William Curtis and his brother James Burrill Curtis, Francis C. Barlow, and Isaac T. Hecker. Among the members, besides Ripley, were Nathaniel Hawthorne (for a short time), Charles A. Dana, and John S. Dwight; and among the visitors who took an active interest in the experiment were Ralph Waldo Emerson, Theodore Parker, Orestes A. Brownson, William Henry Channing, Amos Bronson Alcott, and Margaret Fuller.

In 1844 the organization of Brook Farm was somewhat changed: a modified form of Fourierism was introduced (see FOURIER, F. M.), and *The Harbinger*, the official Fourierist organ, to which many well known writers contributed, was founded. In the next few years, however, the interest in Fourierism declined; in 1846, the 'phalanstery' then under construction, was destroyed by fire, causing a heavy loss, and in 1847 the society disbanded.

Consult Swift's *Brook Farm, Its Members, Scholars, and Visitors;* Codman's *Historic and Personal Memoirs.*

Brook'field, city, Missouri, Linn county, on the Chicago, Burlington and Quincy Railroad; 122 miles northeast of Kansas City. Large car and engine repair shops are located here, and there are grain elevators, roller mills, and a large shoe factory. The city is surrounded by rich agricultural country and is a centre for the shipment of live-stock and coal. Pop. (1910) 5,749; (1920) 6,304.

Brook'hav'en, city, Mississippi, county seat of Lincoln county, on the Illinois Central Railroad; 52 miles south of Jackson. It is the seat of Whitworth Female College, (M. E., S.). The surrounding country is a rich agricultural and lumber region, and the city is the centre of an extensive trucking industry. It has a large creamery, cotton and lumber mills, foundries, and machine shops. Pop. (1910) 5,293; (1920) 4,706.

Brook'ings, city, South Dakota, county seat of Brookings county, on the Chicago and Northwestern Railroad; 54 miles north of Sioux Falls. It is the seat of the South Dakota Agricultural College, and has manufactures of cigars and cement blocks. Pop. (1910) 2,971; (1920) 3,924.

Brook'lime, a small creeping plant (*Veronica beccabunga*) belonging to the Scrophulariaceæ, growing in mud or shallow water in Europe. The small, bright-blue blossoms are borne in axillary racemes; the leaves are opposite.

Brook'line, town, Massachusetts, Norfolk county, a residential suburb of Boston, on the Charles River, 4 miles southwest of the State House, and on the Boston and Albany Railroad. It includes the villages of Longwood, Cottage Farm, Coolidge Corner, and Reservoir. It has handsome residences, a large public library, and a number of hospitals. Electrical supplies and screens are manufactured. Pop. (1900) 19,935; (1910) 27,792; (1920) 37,748.

Brooklyn, borough of New York City (since Jan. 1, 1898), formerly capital of Kings county, N. Y., with which it is coextensive, is situated at the western extremity of Long Island, on East River and New York Bay. It is separated from Manhattan Island by the East River, which connects Upper New York Bay with Long Island Sound, and which, at a distance of about three-fourths of a mile north of Brooklyn Bridge, expands into Wallabout Bay, on the shores of which is the U. S. Navy Yard, occupying over 100 acres of ground. The city has an area of 77.62 square miles, a shoreline of 201 miles, and an improved water front of 25 miles. Brooklyn is often spoken of as a residential city ('New York's bedroom'), as the City of Churches, and the City of Homes. All three descriptions are to a certain extent justified; but the borough has also immense mercantile, manufacturing, and shipping interests, as well as a history and civic life which give it a distinctive and important character. 'The Heights,' an elevation of the East River shore opposite the lower part of Manhattan, is a fashionable residential section. Clinton, St. Marks, Washington, New York, and Brooklyn avenues are also fine residential streets, while the Shore Road section, north of Coney Island has many beautiful homes.

Brooklyn's park system includes Prospect, Fort Greene, Forest, Tompkins, Winthrop, and Bedford Parks. Of these, Prospect Park is the finest, and is said to be unsurpassed in the United States. Connected with it are the splendid Eastern and Ocean Parkways, the latter extending to the beach at Coney Island. The Brooklyn Botanic Garden, opened in 1911, is under the direction of the Brooklyn Institute of Arts and Sciences (q. v.). Greenwood, Evergreen, and Cypress Hills Cemeteries are also notable.

Brooklyn is connected with New York by three great bridges, the Brooklyn, the Williamsburg, and the Manhattan, and three tunnels. Several lines of ferries ply to and from New York and Jersey City. The Long Island Railroad has a terminal at Atlantic Avenue which handles about 35,000,000 passengers annually. There are nearly 225 miles of subway, and 500 miles of surface car lines in operation.

Notable buildings and institutions are the Court House and Borough Hall, Pratt Institute, Adelphi College, Brooklyn Institute, Academy of Music, Brooklyn Museum, Brooklyn Public Library, Long Island Historical Society, Packer Collegiate Institute, and the Polytechnic Institute. Brooklyn has nearly 600 churches, of which the most widely famed are Plymouth Church, whose pulpit was occupied by Henry Ward Beecher for forty years, and the Church of the Pilgrims. There are numerous charitable institutions and over 30 hospitals.

Manufacturing interests are varied and important. Chemical works, shipbuilding, glass works, paint works, bookbinding and printing, and the manufacture of boots and shoes, clothing, foundry and machine shop products, and tobacco products, are among the leading industries. According to the Federal Census of 1919, there were 6,738 industrial establishments with 166,724 wage earners, an invested capital of $704,158,000, and products valued at $1,184,973,000.

Docking and shipping facilities

are extensive. Erie, Brooklyn, and Atlantic Basins, comprising some 140 acres, afford shelter to an annual tonnage of nearly 8,000,000. There is an annual trade of over $1,000,000,000.

History.—Brooklyn was settled by Walloons about 1636, and was joined with four other hamlets into one village in 1646. In 1653 it received a Dutch charter, and in 1655, after the English conquest of New Amsterdam, it received an English charter. Its share in the Revolution was notable. At the western end of Long Island, on Aug. 27, 1776, was fought the memorable battle of that name (q. v.), in which, after a gallant and determined resistance, the comparatively undisciplined American troops were defeated by the British under Lord Howe. Part of this battle was fought within the limits of what is now Prospect Park. In Wallabout Bay were stationed the British prison ships on board which nearly 12,000 prisoners are said to have died within a period of six years.

Brooklyn became a city in 1834. The city of Williamsburg and that of Bushwick were incorporated with it in 1855; New Lots was added in 1866, and, within the next ten years Gravesend, Flatbush, New Utrecht, and Flatlands were annexed. By State legislation in 1897 the city of Brooklyn became, on Jan. 1, 1898, the Borough of Brooklyn in the City of Greater New York.

Brooklyn's population (1920) is 2,018,356. It was 4,402 in 1810; 7,175 in 1820; 15,395 in 1830; 36,233 in 1840; 96,838 in 1850; 266,661 in 1860; 396,099 in 1870; 566,663 in 1880; 806,343 in 1890; 1,166,582 in 1900; 1,634,351 in 1910.

Brooklyn Bridge. See NEW YORK CITY.

Brooklyn Institute of Arts and Sciences, a scientific and educational organization in Brooklyn, New York, incorporated in 1824 as the Brooklyn Apprentices' Library Association and rechartered in 1843 as the Brooklyn Institute. It was reorganized in 1862 and again in 1890. It includes four general departments: the Department of Education, the Department of Museums, the Botanic Gardens, and the Biological Laboratories. The active work of the Department of Education is conducted by several sub-departments, under whose direction addresses, lectures, courses of instruction, concerts, and dramatic readings are arranged for members. The Central Museum, a commodious structure on Eastern Parkway, near the entrance to Prospect Park, is devoted to art, archæology, and natural science. A Children's Museum is also maintained, with historical and natural history exhibits. The Botanic Gardens opened in 1911 rank with the finest in the United States. The Biological Laboratories are at Cold Spring Harbor, Long Island.

Brooks, CHARLES WILLIAM SHIRLEY (1816–74), editor of *Punch*, was for a time parliamentary reporter for the *Morning Chronicle*, leader writer to the *Illustrated London News*, and contributor to several other journals. He was the author of a number of plays, of the novels *Aspen Court* (1855), *The Gordian Knot* (1860), *The Silver Cord* (1861) and *Sooner or Later* (1868), and of a book of travels, *The Russians of the South* (1856). From 1851 he contributed to *Punch* under the signature 'Epicurus Rotundus,' and in 1870 became editor. He initiated the articles headed 'The Essence of Parliament.'

Brooks, JAMES (1810–73), American journalist, was born in Portland, Me. Having graduated (1831) from Waterville College, he formed a connection with the Portland *Advertiser*, and acted as its correspondent in Washington and in the South, his letters setting a new standard for newspaper correspondence. Subsequently he travelled in Europe, and in 1836 established the *Express* in New York City, where he became prominent in politics. He was a member of Congress in 1849–53 as a Whig, and in 1863–73 as a Democrat. He was censured by Congress for his participation in the Crédit Mobilier affair (1873). Some of his newspaper correspondence was later published as *A Seven Months' Run, Up and Down and Around the World* (1872).

Brooks, JOHN (1752–1825), American soldier and political leader, was born in Medford, Mass. He served in the American army throughout the Revolutionary War, rising to the rank of lieutenant-colonel (1778), distinguished himself particularly in the Saratoga campaign, and subsequently was a brigadier-general in the U. S. Army (1792–6). He was a member of the Massachusetts convention (1788) which ratified the Federal Constitution, and from 1816 to 1823 was governor of Massachusetts.

Brooks, MARIA, known as 'Maria del Occidente' (*c.* 1795–1845), American poet, was born (Gowen) in Medford, Mass., and was early married to a Boston merchant who had been her guardian. Her first efforts in verse were not published, but her *Judith, Esther, and Other Poems* appeared in 1820. She is best known for *Zophiël, or the Bride of Seven*, the first canto of which was published in 1825. The complete poem appeared in London in 1833, under the supervision of Robert Southey, a great admirer of the work. In 1843 Mrs. Brooks published a partly autobiographical romance, *Idomen, or the Vale of Yamuri.*

Brooks, NOAH (1830–1903), American author and journalist, was born in Castine, Me., and began work as a newspaper man in Boston in 1850. He was war correspondent of the Sacramento *Union* (1862–5), was on the staff of the N. Y. *Tribune* (1871–5), and of the N. Y. *Times* (1875–84), and in 1884 became editor of the Newark, N. J., *Daily Advertiser*. He retired from newspaper work in 1892. He was a favorite writer for boys. Among his books are *The Boy Emigrants* (1876), *The Fairport Nine* (1880), *Tales of the Maine Coast* (1894), *Abraham Lincoln and the Downfall of American Slavery* (1894); also *Short Studies in American Party Politics* (1896), *The Story of Marco Polo* (1896), *Abraham Lincoln: His Youth and Early Manhood* (1901).

Brooks, PHILLIPS (1835–93), American divine and author, was born in Boston, of Puritan descent, received his early education in the Boston public schools, and was graduated (1855) from Harvard. He studied divinity at the Protestant Episcopal Theological Seminary, at Alexandria, Va., and was ordained deacon in 1859, accepting the rectorship of the Church of the Advent in Philadelphia the same year. In 1862 he became rector of the Church of the Holy Trinity in Philadelphia, where he remained until his acceptance of the rectorship of Trinity Church, Boston, in 1869. Dr. Brooks obtained a considerable reputation as a preacher before leaving Philadelphia, his eloquence being enhanced by his lofty stature and impressive personality. During this period he made the first of the several trips abroad, which extended his personal influence to other countries. At Boston he quickly came in close contact with the leading spiritual and secular powers of the community, and during his rectorship and after his consecration (1891) as fifth bishop of the Protestant Episcopal Church in Massachusetts, he was a dominating force in all matters relating to the social, intellectual, and religious improvement of his city and State. In 1872, the burning of Holy Trinity gave opportunity for the building of its new structure, designed by Richardson with La Farge as decorator, which was completed in 1877. Among

Dr. Brooks's numerous works are *Yale Lectures on Preaching* (1877), *The Influence of Jesus* (1879), Sermons *Preached in English Churches* (1882), and *Literature and Life* (1886). He wrote several Christmas and Easter carols, of which a favorite is that entitled 'O Little Town of Bethlehem!' See *Life*, by A. V. G. Allen (1901).

Brooks, PRESTON SMITH (1819–57), American politician, born in Edgefield district, S. C. He graduated from the College of South Carolina in 1839, became prominent as a lawyer and politician in the state, and served, as a captain of volunteers, in the Mexican War. From 1853 to 1857 he was a representative, as a State's Rights Democrat, in Congress. He is remembered chiefly for his assault (May 22, 1856) on Senator Charles Sumner, who in a recent speech on the 'Crime Against Kansas' had bitterly arraigned South Carolina and one of that state's senators, Andrew P. Butler, then absent, a relative of Brooks. Finding Sumner writing at his desk in the Senate chamber, Brooks beat him into insensibility with a large cane, Sumner being penned to his seat by his chair and unable to defend himself. Sumner was disabled for several years and never fully recovered. The assault caused intense excitement throughout the country; in the North it was regarded with horror and anger; in the South it was generally applauded and approved, and many canes were presented to Brooks as testimonials. A motion to expel him received 121 votes in the House of Representatives, a majority of 26, but not the necessary two-thirds; Brooks thereupon resigned, and was immediately re-elected, almost unanimously, by his district.

Brooks, WILLIAM KEITH (1848), American zoölogist, was born in Cleveland, O., and graduated (1870) at Williams, taking his Ph.D. (1874) at Harvard. In 1874, also, he was appointed assistant at the Boston Society of Natural History, and after 1876 he was associate professor and professor of zoölogy at Johns Hopkins University, where he organized the Chesapeake zoölogical laboratory. Prof. Brooks took a large part in the artificial development of the American oyster. Among his extensive scientific writings are *Handbook of Invertebrate Zoölogy* (1882), *The Development and Protection of the Oyster in Maryland* (1884), *Report on the Stomatopoda Collected by H.M.S. Challenger* (1886), and *The Foundations of Zoölogy* (1898).

Brooks, WILLIAM ROBERT (1844), American astronomer, was born in Maidstone, England, and was brought to Darien, N. Y., by his parents (1857). The following year he constructed a telescope on his own account, and he was giving astronomical lectures at the age of eighteen. After working as a mechanical draughtsman and inventing many appliances for astronomical and other scientific apparatus, he established at Phelps, N. Y., his Red House Observatory (1874), where he surprised the astronomical world by the number of comets he discovered with the telescope, etc., made by himself—eleven in all up to 1888, when he removed to Geneva, N. Y., afterward remaining in charge of the Smith Observatory at that place. Here he made a new record in the matter of discovering comets, announcing thirteen more by 1906, making an unprecedented total for any one observer up to his time. Some of these discoveries were made possible by his own inventions in photography. He became professor of astronomy at Hobart College, and member of learned societies, American and foreign.

Brookville. (**1.**) Bor., Pa., co. seat of Jefferson co., 67 m. N.E. of Pittsburg, on Red Bank Creek and on the Pa. and the Brookville R. Rs. It has foundries, saw and planing mills, etc., a furniture factory, roller mills, breweries, glass-works, and brick-yards. Pop. (1910) 3,003. (**2.**) Tn., Ind., co. seat of Franklin co., 34 m. N.W. of Cincinnati, O., on the White Water R., and on the White Water div. of the Cle., Cin., Chi., and St. Louis R. R. It has pulp, paper, saw and roller mills, furniture, factories, and machine shops. Pop. (1910) 2,169.

Brookweed (*Samolus Valerandi*), a small, herbaceous plant, belonging to the Primulaceæ. It abounds in marshes near the sea. Small white flowers are borne in racemes on a slender stem springing from the centre of a rosette of bright green leaves.

Broom. The common broom (*Sarothamnus scoparius*, *Cytisus scoparius*) is an evergreen shrub about three feet or more in height, with numerous straight twiggy branches, small ternate leaves, and large yellow papilionaceous flowers, followed by dark-brown pods. It thrives everywhere in dry sandy soil, no matter how poor it be. The *Planta genista*, which gave its name to the line of Plantagenet, was the broom. *Scoparii cacumina*, or broom tops, have long held high place as a drug, and the decoction prepared therefrom is still used as a safe and effective diuretic in certain conditions. Besides *C. scoparius*, the yellow-flowered *Cytisus nigricans*, which blooms at midsummer, *C. capitatus* and *C. leucanthus* are hardy, while *C. canariensis* and *C. racemosus* are specially worth growing as greenhouse plants, being the yellow-flowered 'genistas' sold by florists. Propagation is best effected by cuttings of the young wood taken in spring and placed in heat. The use of broom twigs for the making of brooms or besoms is very old; they have also been used for thatching houses; and the flower-buds are said to have some virtue as a pickle. See Hulme's *Wild Fruits of the Countryside* (1902).

Broom.
1, Stamens and pistil; 2, pod.

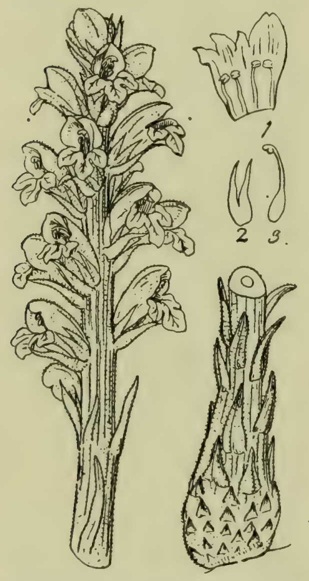
Broom. See BRUSHES.

Broom Corn (*Sorghum* [Andropogon] *vulgare*), an E. Indian reedlike grass cultivated in the United States, and used for making brooms; the seeds afford a food for cattle.

Broome, SIR FREDERICK NAPIER (1842–96), British colonial statesman, born in Canada, but went to New Zealand (1857–69) in early youth. He was colonial secretary of Natal (1875) and of Mauritius (1877), governor of W. Australia (1882), of Barbados (1890), and of Trinidad (1891). His wife, Mary A. Stewart, a native of Jamaica, has written *Station Life in New Zealand* (1869).

Broome, WILLIAM (1689–1745), English translator, was the son of a poor farmer of Haslington, Cheshire. In 1712 he collaborated in a prose translation of the *Iliad*, and was employed by Pope in annotating his own translation. In 1722 Pope proposed to Broome and his friend Elijah Fenton to join him in translating the *Odyssey*. Broome did the 8th, 11th, 12th, 16th, 18th, and 23d books, and all the notes. See Johnson's *Lives of the Poets* (1779–81). For his quarrel with Pope, see Elwin and Courthope's *Correspondence of Pope* (1871–89).

Broom Rape (*Orobancheæ*), about 180 species, belonging chiefly to the temperate regions, all parasitic on the roots of other plants. They are brightly-colored plants, but bear no green leaves, having scales instead. *O. minor* has been naturalized from Europe; is yellowish brown, and parasitic on the roots of clover. The naked broom rape of America is *Thalesia uniflora*, a delicate, leafless plant, sending up groups of gray, pubescent peduncles, bearing lilac-tinted flowers.



European Broom Rape (*Orobanche major*).

1, Calyx (opened), with stamens; 2, scale; 3, pistil.

Brosboll, KARL. See CARIT ETLAR.

Broschi, CARLO. See FARINELLI.

Brothel, a house of prostitution; also known as a bawdy-house or disorderly house. Such a house is a common nuisance at the common law and may be abated by the public authorities on information of any private person, as an infringement of public order and decency, and the keeping of such a house is a misdemeanor.

Brotherhoods, associations of men of the same profession, society, fraternity, or religious order. The chief earlier religious brotherhoods of the Roman Catholic Church were the fraternities known as the Brothers of Mary, of the Scapular, of the Rosary, of the Sacred Heart, and of Francis Xavier. These were followed by the Fratres Pontifices (whose duties were mainly confined to looking after travellers in the neighborhood of bridges and ferries), and the Familiars and Cross-bearers, identified with the Spanish Inquisition. The later brotherhoods were founded in the Netherlands and N. Germany, and they spread over the Continent rapidly, till, in the middle of the 15th century, their number was reckoned at over 150. During the last two centuries there has been a large growth of brotherhoods (generally called confraternities) in connection with the Roman Catholic Church. There are also several brotherhoods in connection with the Church of England.

Brothers, RICHARD (1757–1824), a British naval officer, born in Newfoundland. About 1793 he began to describe himself as the 'nephew of the Almighty,' prophesied his own 'revelation,' on Nov. 19, 1795, as prince of the Hebrews and ruler of the world, and the rebuilding of Jerusalem in 1798. He was arrested and confined in a lunatic asylum in 1795. Nathaniel Brassey Halhed, M.P. for Lymington, to whom Brothers had promised the government of India, attempted to raise his case in Parliament. In 1806 Brothers was released, and was taken charge of by John Finlayson, a Scottish writer, who had given up a lucrative practice at the bar to follow him. In 1794 he published a book of 'prophecy,' *A Revealed Knowledge of the Prophecies and the Times*, which led many to believe in him.

Brough, JOHN (1811–65), American political leader and journalist, born at Marietta, O. As an editor of newspapers at Marietta, Lancaster, and Cincinnati, O., where he founded the *Cincinnati Enquirer*, he became known as an able writer on political subjects and gained considerable political influence throughout the state. He was elected to the Ohio Legislature in 1838, and in 1863, as the Republican candidate and the representative of those who advocated a vigorous prosecution of the Civil War and supported the Lincoln administration, he defeated Clement L. Vallandigham, the Democratic candidate and the leader of the 'Copperheads,' for the governorship, serving in 1864–5 and rendering services of great value to the general government in the last two years of the war. He was one of the three 'war governors' of Ohio, William Dennison serving in 1860–2 and David Tod in 1862–4.

Brough, LIONEL (1836), English actor, born at Pontypool, Monmouthshire. He began life as a clerk to the editor of the *Illustrated London News*, and afterward was on the staff of the *Daily Telegraph*, when he originated the present system of selling newspapers in the streets. He made his first appearance on the stage at the Lyceum Theatre, London, under the management of Madame Vestris (1854). In 1858 he left the stage for five years, during which time he was engaged on the staff of the *Morning Star*. In 1863 he returned permanently to the stage, and has since figured prominently as a low comedian He has visited the U. S. at different times, where he won popularity by his portrayal of comic rôles, among them Paul Pry, and Tony Lumpkin in *She Stoops to Conquer*.

Brougham, HENRY, BARON BROUGHAM AND VAUX (1778–1868), English statesman, scholar, and scientist, was born in Edinburgh, and was called to the Scottish bar in 1800; but owing to his pronounced Whig and Liberal sympathies, and to a reputation for eccentricity and rashness, he met with comparatively little success as an advocate, and in 1805 he migrated to London, where he permanently settled, being called to the English bar in 1808. But in 1802 he joined with Jeffrey and others in founding the *Edinburgh Review*. To the first twenty numbers he contributed no fewer than eighty articles; and the encyclopædic character of his learning, which included natural philosophy and mathematics, natural theology and metaphysics, besides politics and history, was displayed in these early contributions.

At the English bar he contrived to make a great reputation by his success in some celebrated cases, the first of which was as counsel of the Liverpool merchants who petitioned against the Orders in Council which formed part of the commercial war between England and Napoleon. This was in 1810; and soon after he entered the House of Commons, where his turbulent and aggressive eloquence secured him a ready welcome from the opposition. Brougham was a tireless advocate of slave emancipation, of political reform, of law reform, of national education, and of religious equality. Among other projects which he helped to start were the University of London in 1825, and the Society for the Diffusion of Useful Knowledge (1827). He also made a great reputation for himself as a champion of popular rights by his speeches in defence of persons prosecuted by the crown for libel. His most celebrated case was his defence of Queen Caroline in 1820, which so endeared him to the English people that for the next ten years he was almost a popular idol. In 1830 he was made Lord Chancellor, and was largely instrumental in getting the Reform Bill passed in 1832. Invaluable in opposition, as a colleague in office he was too turbulent, vain, and rash; and when the Whig ministry was reconstructed in 1834, Brougham was neither then, nor at any subsequent date, reappointed to office. His writings were published in 11 vols. in 1855-61. *His Memoirs of His Life and Times* are hardly trustworthy. Consult Bagehot's *English Constitution*.

Brougham, JOHN (1814-80), Irish-American dramatist and actor, was born in Dublin. Besides acting, he undertook theatrical management, first in London, but removed in 1842 to the United States, where he became a member of the stock company of Burton's Theatre in New York. For a time he was manager of Niblo's Garden; in 1850 opened Brougham's Lyceum, which was afterward Wallack's Theatre; then attempted the management of the Old Bowery Theatre—all in New York. He opened Brougham's Theatre in 1869, an unsuccessful venture, and appeared on the stage for the last time in 1879 at Booth's Theatre, New York. As an actor he excelled in Irish parts. He wrote over seventy plays, among the best known being *The Duke's Motto, Bel Demonio, Romance and Reality*, and the burlesque *Pocahontas*.

Broughton, BARON. See HOBHOUSE.

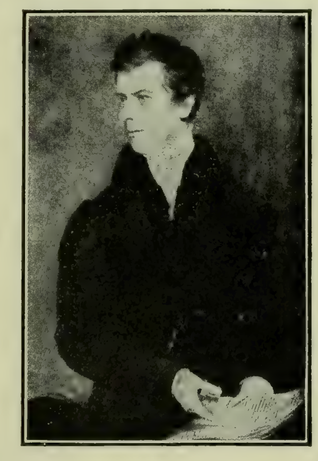
Broughton, RHODA (1840), English novelist, was born in Denbighshire, Wales. She began novel writing with a work entitled *Not Wisely but Too Well* (1867), which became popular immediately, and was followed by other novels in quick succession. Her works possess originality, vigor, and a certain undisciplined power. Among her books are *Red as a Rose Is She* (1870); *Nancy* (1873); *Joan* (1876); *Dr. Cupid* (1886); *Scylla and Charybdis* (1895); *Foes in Law* (1901); *Lavinia* (1902).

Broughty-Ferry, town, Forfarshire, Scotland, on the north side of the Firth of Tay, 3½ miles east of Dundee. It is a seaport and fishing town, and the residence of Dundee merchants. Pop. 12,000.

Broussa. See BRUSA.

Broussais, FRANÇOIS JOSEPH VICTOR (1772-1838), French physician, was born in St. Malo. He served as surgeon through campaigns in Germany, Holland, Italy, and Spain; also in the navy. Appointed in 1820 professor at the military hospital of Val-de-Grâce, Paris, and in 1831 professor of general pathology at the Academy of Medicine, Paris, he founded a peculiar theory of medicine—*Histoire des Phlegmasies ou Inflammations Chroniques* (1808), and *Examen de la Doctrine Médicale généralement adoptée* (1816)—in which he defined life as dependent upon irritation, and disease, primarily local in its origin, as excessive or insufficient irritation.

Brousson, CLAUDE (1647-98), French Huguenot leader, was born in Nîmes. He became a lawyer and the legal defender of the Huguenot poor, as well as a leader in their meetings to protest against persecutions. His house in Toulouse was the meeting place of the Huguenot assembly that drew up the famous 'Project' (1683) to hold services simultaneously throughout the country on the ruins of the Protestant meeting houses. Brousson was compelled to flee from France, but in exile was active in improving conditions for refugees and in inspiring fresh hope among his fellow-sufferers. Though a price was on his head, he returned to France as a preacher (1689), but was not ordained until 1694. From 1694 to 1696, and in 1697-8, he was again in France, conducting meetings with extraordinary boldness and success. When the persecutions continued after the Peace of Reyswick, he addressed a series of appeals to the king. In 1698 he was arrested at Oloron, tried, and broken on the wheel. Consult Nègre's *Vie et Ministère de Claude Brousson*, which contains many of his writings



Lord Brougham.
(From the Portrait by Lonsdale.)

Brouwer, or BRAUWER, ADRIAN (? 1606-38), Dutch painter, was born of humble parentage at Oudenarde. He studied at Haarlem (1626-7) under Frans Hals, a hard taskmaster, from whose cruelties he fled to Amsterdam, and thence to Antwerp (1630), where he was arrested as a spy, but obtained his liberty, as the story goes, by painting a picture which Rubens recognized as the work of the painter. A life of dissipation brought him to an early death. His subjects, like those of his countryman Teniers, were chosen from low life—tavern brawls, country feasts, boors playing cards, etc. —but are all executed with admirable expression, brilliant coloring, and exquisite finish and vigor. Consult Bode's *Life*.

Brower, JACOB VRADENBERG (1844-1905), American archæologist, was born in York, Mich. In 1894-5 he discovered mounds and the site of the ancient village at Itasca Lake; in 1897-8 he was engaged in an attempt to rediscover the site of the ancient Quivira, which Coronado had visited, and in 1900 he identified over 1,100 ancient mounds at Mille Lac, Minn. His writings include *The Mississippi River and Its Source* (1893); *Prehistoric Man at the Head-Waters of the Mississippi* (1895); *The Missouri River and Its Utmost Source* (1896); *Quivira* (1898); *Mille Lac* (1900).

Brown, Mount, peak in Rocky Mountains, Canada, near source of rivers Fraser and Columbia, and between Alberta and British Columbia. Long reputed the highest peak of the Rockies, it was estimated by Coleman to be only 9,055 feet high.

Brown, AARON VENABLE (1795-1859), American legislator, was born in Brunswick co., Va., and graduated (1814) at Chapel Hill University, N. C. He removed to Tennessee, was admitted to the bar, and became the partner of James K. Polk. After serving in the Tennessee legislature for a dozen years, he represented his State in Congress from 1839 to 1845, when he was elected governor. As a delegate to the Southern convention of 1850, at Nashville, he prepared 'the Tennessee platform,' and was long prominent in Democratic councils. He was Postmaster-General under President Buchanan, and developed new mail routes to the West before the completion of the railroads. His *Speeches* were published in 1854.

Brown, Alexander (1843-1906), American historian, was born in Nelson County, Va. He was educated at Lynchburg College (1860-1), served in the Confederate Army during the Civil War, and thereafter was in turn a merchant and a farmer, though he devoted himself primarily to the study of the early history of Virginia. His important works are *The Genesis of the United States* (2 vols., 1890), a valuable collection of documents and of biographical sketches of persons concerned in the settlement and administration of Virginia, and *The First Republic in America* (1898). He also wrote: *New Views of Early Virginia History* (1886); *Our Earliest History* (1898); *English Politics in Early Virginia* (1901).

Brown, Benjamin Gratz (1826-85), American legislator and executive, was born in Lexington, Ky. He was graduated at Transylvania University in 1845, and at Yale in 1847, and was admitted to the bar in 1851. He practised law in St. Louis; was chief editor and part owner of the *Missouri Democrat,* and was a prominent anti-slavery leader in the State legislature (1852-9). He served in the Union Army in the Civil War, rising to the rank of brigadier-general of volunteers. He was a U. S. Senator (1863-7), and governor of Missouri (1871-3). After being defeated for the Vice-Presidency on the Republican ticket headed by Horace Greeley (1872), he resumed the practice of law in St. Louis.

Brown, Charles Brockden (1771-1810), the first prominent American novelist, was born of Quaker parentage at Philadelphia, Pa. He early developed an inclination for letters, fostered to a degree injurious to his health by his parents and by his teacher, Robert Proud, a writer of repute. He studied law, but soon gave this up for literary work. His writings show the influence of the French philosophical writers of his day, and of Godwin and other English radicals. His first attempt at literature, *Alcuin* (1797), was a dialogue on the social position of women and the marriage problem. The novel, however, became his medium of expression for the moral and psychological ideas in which he was primarily interested. The next four years were most prolific. *Wieland* (1798) was followed by *Ormond, Arthur Mervyn,* and *Edgar Huntly* (1799)—the last-named being the first important story of Indian life; *Clara Howard* (1801), and *Jane Talbot* (1804). His books were popular, but not profitable, and he was forced to rely on his parents for support. In 1799 he published for a few months the *Monthly Magazine and American Review,* and from 1803 to 1808 he edited the *Literary Magazine and American Register.* He wrote a number of political essays (1803-9). His novels are characterized by lively diction, varied and plentiful incident, which is, however, full of improbabilities and of actions without adequate motive. Brown followed the English Gothic school of horrors and mysteries, with only the change from mediæval to American backgrounds. He is said to have had considerable influence on Hawthorne through his preoccupation with moral problems. A collected edition has been published, with *Life* by Dunlap. Consult Prescott's *Biographical and Critical Miscellanies*; Erskine's *Leading American Novelists* (1910).

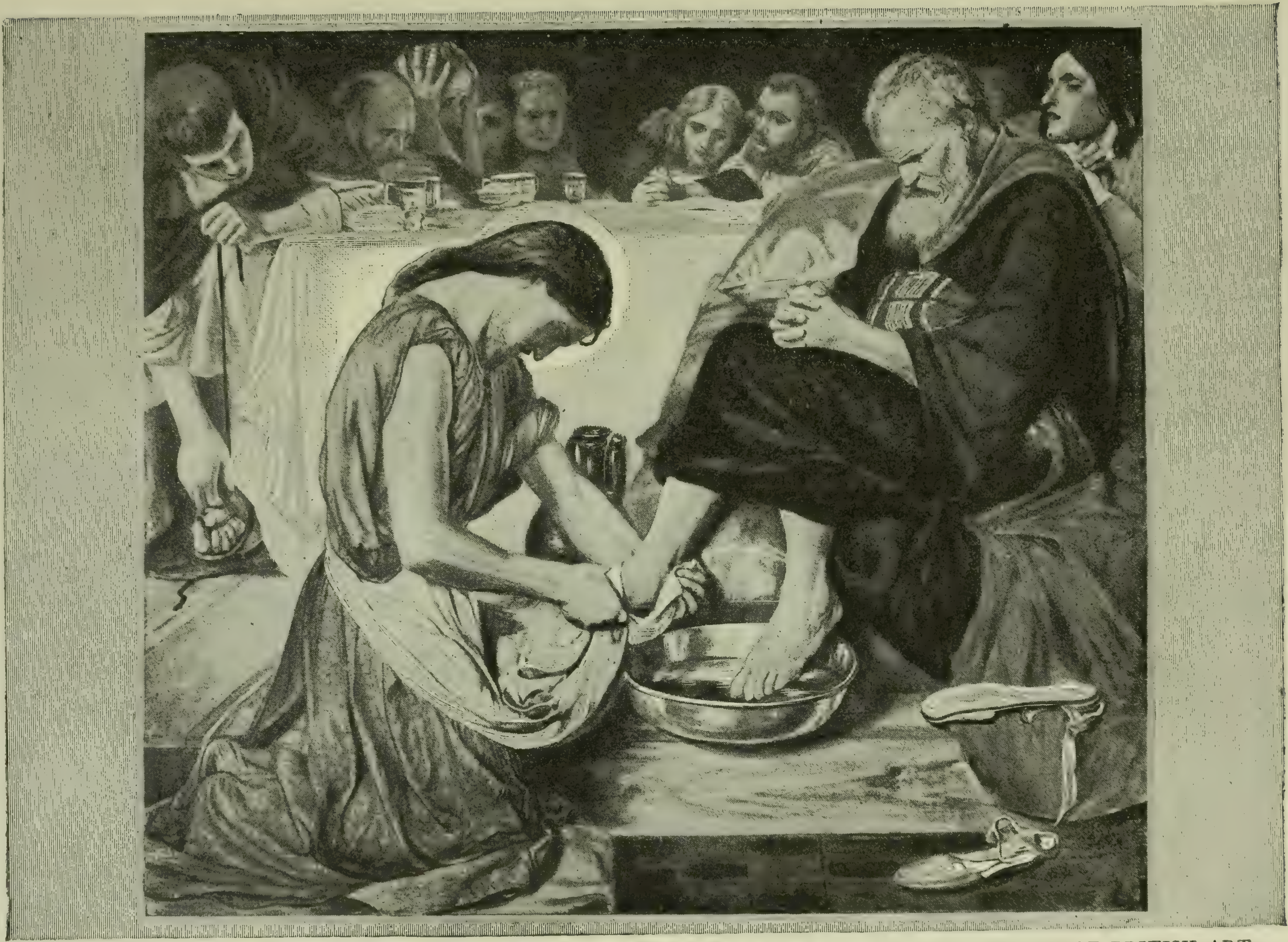
Brown, Elmer Ellsworth (1861), American educator, was born in Kiantone, N. Y. He was graduated at the Illinois State Normal University (1881) and at the University of Michigan (1889), and gained the degree of Ph.D. at the University of Halle-Wittenberg (1890). He was principal of the public schools of Belvidere, Ill. (1881-4); assistant professor (1891-2) of the science and art of teaching at the University of Michigan; head of the department of education in the University of California (1892-1906). In July, 1906, he became United States commissioner of education, and in July, 1911, Chancellor of New York University. He is a member of the National Council of Education and a fellow of the American Association for the Advancement of Science. He received the degree of LL.D. from Columbia University in 1907. He has written *Making of Our Middle Schools* (1903); *Origin of American State Universities* (1905); *Government by Influence* (1909).

Brown, Ernest William (1866), American mathematician and educator, was born in Hull, England. He was educated at Christ's College, Cambridge. He was professor of mathematics at Haverford College from 1891 to 1907, and has held the same chair at Yale University since 1907. He is a fellow of the Royal Society, of the Royal Astronomical Society (from which he received a gold medal in 1907), of the American Philosophical Society, and a member of other mathematical societies in the United States and England. Besides many papers on lunar theory and celestial mechanics, he has written *Treatise on the Lunar Theory* (1896); *New Theory of the Moon's Motion* (1897-1908); *Inequalities in the Motion of the Moon Due to the Direct Action of the Planets* (1908, Adams Prize Essay).

Brown, Ford Madox (1821-93), British historical painter, and pioneer of the pre-Raphaelite movement, was educated in Belgium. He studied painting under Wappers; also in Rome and Paris. His true teachers were Holbein and the fifteenth-century Italian masters, from whom he developed his sense of grand style and archaism of form. In 1844 he competed for the wall decorations at Westminster Hall, London. His designs were the indirect means of bringing him into contact with Rossetti, his pupil and friend, and other members of the pre-Raphaelite brotherhood. Among his masterpieces are *Christ Washing St. Peter's Feet* (National Gallery, London); *Last of England*; *Work*; *King René's Honeymoon*; *King Lear*; *Cordelia's Portion*; *Cromwell at St. Ives.* He also designed cartoons for stained glass for William Morris. Consult his *Life* by Hueffer and by H. Rossetti; Cox's *Old Masters and New* (1905).

Brown, Francis (1849), American theologian and educator, was born in Hanover, N. H. He was graduated (1870) at Dartmouth, and at Union Theological Seminary (1877), and having been appointed as fellow of the seminary, studied at the University of Berlin (1877-9). In 1879 he was appointed instructor in Biblical philology at Union Theological Seminary, where he became associate professor in the same subject (1881-91), and professor of Hebrew and cognate languages in 1891. Since 1908 he has also been president of the faculty. Among his books are *Assyriology—Its Use and Abuse in Old-Testament Study* (1885); *The Teachings of the Twelve Apostles,* edited with Dr. Roswell D. Hitchcock (1884); *A Hebrew and English Lexicon of the Old Testament,* with Driver and Briggs (1891-1906); *The Christian Point of View,* with Profs. Knox and McGillert (1902).

Brown, Sir George (1790-1865), British general, was born near Elgin, Scotland. He distinguished himself in the Peninsular War (1808-13), and in the United



CHRIST WASHING ST. PETER'S FEET. BY FORD MADOX BROWN. IN THE NATIONAL GALLERY OF BRITISH ART (TATE GALLERY), LONDON.

States (1814), where he fought at Bladensburg, near Washington. Having attained the rank of lieutenant-general, he was sent, in command of the Light Division, to the Crimea (1854-5), and behaved gallantly at Alma and Inkermann, being severely wounded in the latter battle. In 1860 he became commander-in-chief in Ireland.

Brown, GEORGE (1818-80), Canadian journalist, the son of a well-known newspaper man, was born in Edinburgh, Scotland. He received an academic education. He went with his father to New York (1838), where he was for a few years publisher of his father's paper. He visited Canada in 1843, and established the Toronto *Globe* (1844), which was at first published as a weekly. He also took an active part in politics for many years, entering Parliament in 1852, and being a consistent advocate of reform in Canadian matters. He was a member of the coalition government of 1864, formed to promote confederation (effected in 1869), and was joint plenipotentiary with Sir Edward Thornton at Washington, D. C. (1874), for the negotiation of a commercial treaty with the United States. In 1873 he became a member of the Canadian Senate. Consult his *Life and Speeches*, by Alexander Mackenzie (1882); Lewis' *George Brown* (1906).

Brown, GEORGE DOUGLAS (1869-1902), Scottish author, was born in Ochiltree, Ayrshire. After graduating at Oxford in 1895, he proceeded to London, and entered upon literary and journalistic work, acting as literary adviser to Macqueen, the publisher. In 1901 he brought out his novel, *The House with the Green Shutters*, a powerful story of Scottish life, published under the pen-name of 'George Douglas.'

Brown, GEORGE LORING (1814-89), American landscape painter, was born in Boston, Mass. After spending twenty years in Europe, he returned to the United States in 1860. His subjects are mainly American and Italian landscapes, among them being *Niagara by Moonlight; Doge's Palace and Grand Canal*; *Bay of Naples*; *Crown of New England; Bay of New York.*

Brown, GEORGE WILLIAM (1812-90), American jurist, was born in Baltimore, Md., and was graduated (1831) at Rutgers College. He became a prominent member of the Baltimore bar, of which city he was mayor at the outbreak of the Civil War, and in that capacity assisted in suppressing the disorders in April, 1861. He served in the Maryland constitutional convention of 1867, and was chief judge of the Baltimore supreme court from 1873 to 1888; at the same time acting as professor of international and constitutional law in the University of Maryland. He was joint author of a *Digest of the Maryland Reports* (1847).

Brown, GOOLD (1791-1857), American grammarian, was born in Providence, R. I., of Quaker descent. He received his education from his father, and at the Friends' school, early developing a strong interest in literature and language. In 1810 he began work as a teacher in Rhode Island, and the following year took a position at a Friends' boarding school in Dutchess county, N. Y. He established an academy of his own in New York City in 1813, and conducted it for twenty years, during which period, and subsequently, he devoted himself to the perfection of his system of English grammar. His *Institutes of English Grammar* (1823) was followed by *First Lines of English Grammar* (1823). In 1851 he published *A Grammar of English Grammars*, a monumental work, covering almost every conceivable point of the subject of which it treats.

Brown, HARVEY (1796-1874), American soldier, was born in Rahway, N. J. He was graduated at West Point in 1818; served against the Seminole Indians in Florida, being brevetted major for gallant conduct and general efficiency; distinguished himself in the Southern campaign of the Mexican War, and won the brevet of lieutenant-colonel at Contreras and that of colonel at the Gate of Belen, City of Mexico. After the outbreak of the Civil War, as colonel, he held Fort Pickens against a Confederate attack (Nov. 22-23, 1861), thus earning the brevet of brigadier-general. He was subsequently transferred to New York City, and in 1866 was brevetted major-general for distinguished services in the suppression of the riots there. He retired from active service in 1863.

Brown, HENRY BILLINGS (1836-1913), American jurist, was born in South Lee, Mass. He was graduated at Yale (1856), and studied at the Yale and Harvard Law Schools. Entering a law office in Detroit, Mich., he was admitted to the bar in 1860. He was assistant U. S. district attorney from 1863 until his appointment (1868) as judge of the State circuit court. He then resumed the practice of his profession, in which he gained high repute. In 1875 he was appointed by President Grant, U. S. judge for the eastern district of Michigan, and in 1890 was made an Associate Justice of the U. S. Supreme Court. He became a special authority on admiralty law, and published a volume of *Admiralty Reports* (1875). He retired from the bench in 1906.

Brown, HENRY KIRKE (1814-86), American sculptor, was born in Leyden, Mass. He studied art in Boston and in Italy, and made his permanent residence in Brooklyn, N. Y. His chief work was the equestrian statue of *Washington* in New York City, which is notable as the first important piece of bronze statuary cast in the United States. His statue of *Lincoln* in the same city has been criticised, but his equestrian statue of *General Scott* in Washington is a most artistic work. Other works are the statue of *De Witt Clinton* in Brooklyn, and busts of *William C. Bryant* and *Willard Parker.*

Brown, JACOB (1775-1828), American soldier, was born in Bucks county, Pa. He was a government surveyor in Ohio (1796-8); military secretary to Gen. Alexander Hamilton (1798-1800), and about 1810 became brigadier-general of New York State militia. He is chiefly remembered for his services in the War of 1812. At first he was in command in Northern New York, where he defeated the English at Ogdensburg (Oct. 4, 1812) and at Sackett's Harbor (May 29, 1813). He became a brigadier-general in the regular U. S. Army in 1813, and a major-general in 1814. During the latter part of the war he was in command of the Army of Niagara, defeating the British at Chippewa (July 5, 1814), and commanding the American forces in the latter part of the battle of Lundy's Lane (q. v.), in which he was severely wounded. From 1815 until his death he was the senior officer in the army, and after 1821 the general-in-chief.

Brown, JOHN (1800-59), American abolitionist, was born in Torrington, Conn. He was in turn a land surveyor, a tanner, a sheep raiser, a wool trader, and a farmer, meeting with little success in these occupations. He early conceived a hatred of slavery, and in 1834 planned a school for negroes, hoping to bring about emancipation by education. In 1839 all the members of his family took an oath to help in the abolition of slavery; and within the next ten years the idea developed in his mind that force was the necessary and justifiable means of accomplishing this end.

In 1849, however, Brown settled on a farm in Mount Elba, N. Y., where Gerrit Smith had established a negro colony, and here he entered with enthusiasm upon the work of helping his colored neighbors. In the early fifties, the Virginia plan which caused his death was formed, being known to friends as early as 1854 or 1855; but he was diverted from its execution by the troubles in Kansas.

In 1855, Brown joined five of his sons, who had gone to help the abolition cause in Kansas, where, as a result of the passage of the Kansas-Nebraska Bill (q. v.), the advocates and the opponents of slavery were already contending fiercely. Settling near Ossawatomie, 'Old Brown,' as he was called, immediately became the leader of the radical element of the anti-slavery, or 'Free State' party. Pro-slavery threats of violence and murder, with open dishonesty at the polls, inflamed the 'Free State' men; and Brown led a band of eight to the murder of five of his pro-slavery opponents ('the Pottawatomie Massacre,' May 25, 1856). He did not actually take part in the murders, but without doubt both inspired and approved of them. 'I have no choice,' he said, before the massacre. 'It has been decreed by Almighty God, ordained from eternity, that I should make an example of these men.' Though Brown's energy of purpose made him personally feared by the pro-slavery party, the massacre failed to have the desired effect, for the bitterness of the border warfare was rather increased than diminished thereby. During 1858, under the name of Shubel Morgan, Brown was again in Kansas for six months. This visit was notable for his raid across the Missouri border to free eleven slaves.

The Virginia scheme, the scene of which was laid at Harper's Ferry, was brought to a head in 1859. The plan was to seize, with the help of an armed force, a strong position in the mountains, whence slave-liberating forays could be made into the surrounding country, and slave-holding made insecure. It contemplated, at first, no attack on United States property, and it had the support of some of the most prominent of the Northern abolitionists, including Thomas Wentworth Higginson, Gerrit Smith, and Theodore Parker.

In 1859, Brown, with his men, spent the summer on a farm in the neighborhood of Harper's Ferry. On Oct. 16, with nineteen followers, five of whom were negroes, he surprised and captured the United States arsenal. On Oct. 18 he was taken prisoner, after being wounded, by United States troops under Robert E. Lee. He was tried and convicted for treason and murder, and on Dec. 2 was hanged at Charlestown, Va. (now W. Va.). His body was taken under special guard to North Elba, where, near the old farmhouse, a huge rock marks his grave.

The affair created a profound sensation throughout the country, and, though conservative Northerners expressed strong disapproval of Brown's attack, it undoubtedly added greatly to the bitterness felt by the South for the North, and probably hastened the Civil War. During the war a popular song in the Federal Army had for its refrain:

> John Brown's body lies a-mouldering in the grave,
> But his soul goes marching on.

John Brown has been and perhaps always will be the subject of controversy. To Emerson and Thoreau, probably unacquainted with the Pottawatomie murders, he was a saint and hero. Later writers, knowing the facts, laud him as a martyr, while others denounce him as a desperado, a ruffian, and a criminal. The truth, as usual, seems to lie between the two extremes. From however high a motive, he was responsible for deeds which were abhorrent to the moral sense of a civilized community. But deeply imbued with the stern religious convictions of his Puritan forefathers, in many respects a nineteenth-century Cromwellian, ascetic in his habits, a fanatic in temperament, wholly sincere and honest, devoted with his whole soul to the right as he saw it, a visionary and an enthusiast, he appeals to the imagination by his fervor of conviction, and commands respect by his singleness of purpose. Consult Sanborn's *Life and Letters*; Hinton's *John Brown and His Men*; Avey's *Capture and Execution of John Brown* (1906); Du Bois' *John Brown* (1909); Hill's *Decisive Battles of the Law* (1907); Villard's *John Brown* (1910).

Brown, John, of Haddington (1722-87), Scottish Presbyterian divine, was born in Carpow, Perthshire. While a herd boy on the Abernethy hills he learned Latin and Greek, and passed ultimately into the Secession ministry. In 1751 he was settled at Haddington, where the remainder of his life was spent. In 1784 he declined a call to the pastorate of the Dutch Church in New York. Brown was professor of divinity in the Secession Hall from 1768. Of his writings, entirely theological, the best remembered are *Dictionary of the Bible* (1768), and *Self-Interpreting Bible* (2 vols., 1778). He was a man of vast learning, and excelled in Oriental lore. Consult W. Brown's *Memoirs*.

Brown, John (1735-88), Scottish physician, was educated in Duns, Berwickshire, and studied medicine in Edinburgh. His innovations in medical practice led to his formal ostracism in Edinburgh in 1778, whereupon he removed to London. Here he died, after ten years of poverty. His doctrines, known as the Brunonian system, now medical commonplaces, were promulgated in *Elementa Medicinæ* (1780), which consisted chiefly in an attack on the indiscriminate use of blood-letting. Brown distinguished 'asthenic' (or weakening) troubles from 'sthenic' conditions, and pointed out that the former required a strengthening and supporting treatment. Thus, alcohol and opium were his favorite medicines. Consult *Life* by W. C. Brown and by Dr. Beddoes.

Brown, John (1736-1803), American merchant, was born in Providence, R. I. Like his father, James Brown, he became a successful merchant, the first Rhode Islander to trade in the East Indies. He was implicated in the destruction of the British sloop-of-war *Gaspé* in Narragansett Bay (1772), but the case was not proved against him. Just before the opening of the Revolution he received a large consignment of powder from abroad, and was thus enabled to supply the Continental Army. He laid the corner-stone of the first building of Rhode Island College, now Brown University, of which he was a benefactor, and the treasurer for 20 years.

Brown, John (1784-1858), Scottish divine, was born in Whitburn, Linlithgowshire. He was moderator of the Associate Synod in 1818, and was professor of exegetical theology to his denomination from 1834 till his death. He was a notable figure in the religious history of his time, a profound theologian, a prolific writer, and a preacher of rare eloquence.

Brown, John (1810-82), Scottish author and physician, was born in Biggar, Lanarkshire. Apprenticed in 1827 to Syme, the surgeon, he afterward settled down to professional life in Edinburgh. Dr. John Brown has been called the Charles Lamb of Scottish literature. His writings, collected into the three volumes of *Horæ Subsecivæ* (1858-61), are among the most charming in the language. The most popular and the finest of his productions is *Rab and His Friends* (1859); while *Pet Marjorie* (1863) and *Jeems the Doorkeeper* (1864) will not soon be forgotten.

Brown, JOHN GEORGE (1831), American painter, was born in Durham, England. He was educated in Newcastle-on-Tyne, and studied at the Scottish Royal Academy. After his removal to the United States, in 1853, he continued his studies at the schools of the National Academy of Design in New York, and became noted for his success in painting children. He was made a member of the National Academy (1863); was president of the American Water Color Society (1887-1904), vice-president of the National Academy (1899-1904), and for ten years president of the Artists' Fund Society. He is also noted for his realistic paintings of New York bootblacks and newsboys. Some of the best known are *The Stump Speech*; *His First Cigar*; *The Passing Show*; *A Merry Air and a Sad Heart*; *Dress Parade*; *The Three (Scape) Graces*; *Heels Over Head.*

Brown, JOHN NEWTON (1803-68), American clergyman, was born in New London, Conn. He was graduated (1823) at the institution which became Colgate University, where he also received theological instruction. He was pastor of Baptist churches in New York and other Eastern States until 1838, when he became professor of theology and ecclesiastical history in the Theological Institution at New Hampton, N. H. He was afterward editorial secretary of the Baptist Publication Society, and editor of church periodicals. He prepared and revised the 'New Hampshire Confession,' and edited the *Encyclopædia of Religious Knowledge* (1835).

Brown, JOSEPH EMERSON (1821-94), American lawyer and legislator, was born in Pickens county, S. C. He was graduated at the Yale Law School (1846). He was elected governor of Georgia in 1857, and re-elected until the close of the Civil War, during which he was the most active Secessionist governor of the Southern States. He was chief justice of the Georgia supreme court (1868-70); president of the Western and Atlantic Railroad; and U. S. Senator (1880-91).

Brown, NICHOLAS (1769-1841), American merchant and philanthropist, nephew of John Brown (1736-1803), was born in Providence, R. I. He was graduated at Rhode Island College in 1786. Five years later he inherited his father's fortune, and formed the firm of Brown & Ives, with his brother-in-law as partner. A liberal benefactor of his alma mater, its name was changed to Brown University in his honor. He also gave liberally to other institutions. Consult Hunt's *American Merchants.*

Brown, NORRIS (1863), American legislator, was born in Maquoketa, Ia. He was graduated at the Iowa State University in 1883, and admitted to the bar the same year. He settled in Kearney, Neb., in 1888; was deputy attorney-general of Nebraska in 1900-04; and attorney-general in 1904-06. He was elected U. S. Senator for the term of 1907-13.

Brown, PETER HUME (1850), Scottish historian, was born in Haddingtonshire. He was educated at Edinburgh University, and intended to enter the Church, but took to literature instead. In 1898 he was appointed editor of the Register of the Privy Council of Scotland, and in 1901 Fraser professor of ancient history and palæography in Edinburgh University. Since 1908 he has been historiographer-royal for Scotland. His works include *George Buchanan, Humanist and Reformer* (1890); *Early Travellers in Scotland* (1891); *Scotland Before 1700* (1893); *John Knox* (1895); *History of Scotland* (1898-1909); *Scotland in the Time of Queen Mary* (1908).

Brown, ROBERT, founder of the Brownists. See BROWNE.

Brown, ROBERT (1773-1858), Scottish botanist, was born in Montrose. He resigned a position as assistant surgeon in the army to become naturalist to the expedition under Flinders that explored the coast of Australia. He returned to Britain in 1805, bringing with him a collection of 4,000 species of plants. He was later librarian to Sir Joseph Banks and librarian of the Linnæan Society. He published the results of his researches in *Prodromus Floræ Novæ Hollandiæ* (1810), the first British work on botany which treated of plant arrangement in a truly philosophical spirit. In 1823 Sir Joseph Banks bequeathed to Brown his library and herbarium, which the latter handed over to the British Museum. In 1827 he became keeper of the botanical department of that institution. In the same year he discovered 'Brownian movements' (q. v.) In 1839 he was awarded the Copley medal of the Royal Society. Brown's *Miscellaneous Botanical Works* (2 vols.) were edited by J. J. Bennett.

Brown, SAMUEL ROBBINS (1810-80), American missionary, was born in Connecticut, and was graduated (1832) at Yale. He went as a missionary to China in 1838, and founded the Morrison Chinese School for boys at Canton, the first Protestant school in China, remaining at its head until 1847. Returning to the United States, he again visited the Orient in 1859, settling at Yokohama, Japan, in which country he was one of the earliest Protestant missionaries. He translated the Bible into Japanese, and published grammars of the Japanese language, besides numerous papers on Oriental subjects.

Brown, SANGER (1852), American physician, was born in Bloomfield, Ontario, Canada. After a course at the University of Belleville, Ont., he was graduated (1880) at the Bellevue Hospital Medical College, New York. He was assistant physician and medical superintendent of various psychopathic institutions in the East (1880-6), and in 1890 became professor of neurology at the Chicago Post-Graduate Medical School. He was professor of medical jurisprudence and hygiene at Rush Medical College (1892-7), associate professor of medicine and clinical medicine (1901-6), and has been professor of clinical neurology since 1901 at the College of Physicians and Surgeons of the University of Illinois.

Brown, THOMAS (1663-1704), English satirist, generally styled 'Tom' Brown, author of numerous dialogues and other miscellanies, was a native of Shropshire. As a student he distinguished—and extinguished—himself at Oxford by his rendering of Martial's epigram, which he applied to the dean of his college, beginning 'I do not love thee, Dr. Fell.' From Oxford he went to London, where he laid out his powers on jests and buffoonery, levelled principally at the distinguished men of the time.

Brown, THOMAS (1778-1820), Scottish metaphysician. Having studied law and medicine, in 1806 he became partner of the celebrated Dr. Gregory. Dugald Stewart, professor of moral philosophy in Edinburgh University, being in a declining state of health, Brown was appointed his colleague in 1810. His *Lectures* (21st ed. 1870) were published shortly after his death, and were popular in Great Britain and the United States. In 1804 (new ed. 1824) he produced an elaborate *Inquiry into the Relation of Cause and Effect*, in defence of Hume. Brown was a disciple of the Scottish school of Reid and Stewart.

Brown, THOMAS EDWARD (1830–97), English schoolmaster and poet, was born in Douglas, Isle of Man. After taking orders and serving as vice-principal of King William's College and master of the Crypt School, Gloucester (1858–61), he went to Clifton College, Bristol, where he was assistant master under Dr. Percival from 1864–93. His English poetry is full of sentiment and imagination, but has been little valued in proportion to its deserts, either before or since his death. His Manx poems, chiefly rollicking narratives in a racy dialect, were prompted by a passionate love of his native island, with every corner of which he was familiar, and to which he retired on leaving Clifton in 1893. His published works include *Betsy Lee* (1873); *Fo'c'sle Yarns*, etc. (1881; 2d ed. 1889); *The Doctor*, etc. (1887); *The Manx Witch*, etc. (1889); *Old John, and Other Poems* (1893); *Collected Poems* (with portrait), edited by W. E. Henley, H. G. Dakyns, H. F. Brown (1900); *Letters*, edited by S. T. Irwin (1900).

Brown, WALTER FOLGER (1869–), American public official, was born in Massillon, Ohio. He was graduated from Harvard University in 1892 and from Harvard Law School in 1894, after which time he practised his profession in Toledo. He was appointed by President Harding to effect a reorganization of the Federal bureaus but his plan was so wide reaching that Congress has never accepted it. After serving as assistant Secretary of Commerce from 1927 to 1929, he became Postmaster General in President Hoover's cabinet.

Brown, SIR WILLIAM (1784–1864), British merchant and banker, was born in Ballymena, Ireland. When he was sixteen he went to the United States, where he started his commercial career in the linen trade in Baltimore. In 1809 he returned to England, and established a branch of his firm at Liverpool, becoming, at the same time, a general merchant, and subsequently a banker, founder of the firm Brown, Shipley and Company. He acquired immense wealth, and a few years before his death gave £40,000 to erect the Public Library and Derby Museum in Liverpool, which was opened in 1860. He represented South Lancashire in Parliament in 1846, 1847, 1852, 1857, and 1859, when he retired, and in 1863 was raised to the peerage.

Brown Bess, the English soldiers' name for the regulation bronzed flintlock musket formerly used in the British army.

Brown Coal, or LIGNITE, a variety of coal. See LIGNITE; COAL.

Browne, CHARLES FARRAR (1834–67), better known as ARTEMUS WARD, American humorist, was born in Waterford, Me. At first a compositor, and then a reporter and contributor to various newspapers, in 1858 he began to write in the *Cleveland Plain Dealer*, under the title of 'Artemus Ward, showman.' His droll contributions, with their mixture of quaint spelling, keen wit, and shrewd common sense soon came to be widely read. In 1860 he left Cleveland for New York City, to work on a new comic paper, *Vanity Fair*, which, however, had only a brief existence. He then gave, in Brooklyn, N. Y., his first satirical lecture, *The Babes in the Wood*, which was conceived in a unique vein of humor, and in which the lecturer said nothing whatever about the 'Babes.' With this lecture he travelled (1862) over the plains and the Rocky Mountains, meeting with some adventures among the Indians and the Mormons, the latter of whom were utilized for future lecture material. From 1864 to 1866 ill-health prevented his lecturing, but in 1866 he visited England and opened his show with a panorama in the Egyptian Hall. His lectures excited roars of laughter, his wit being, to Englishmen, of a new and wholly unconventional type, but his health failed rapidly and he died at Southampton. Many of his sketches were published in volumes, respectively entitled *Artemus Ward, his Book* (1865); *Artemus Ward, his Travels among the Mormons* (1866); and *Artemus Ward in London* (1867). They were subsequently collected into a single volume, entitled *The Complete Works of Artemus Ward*, with a biographical sketch by Melville D. Landon (1875).

Browne, EDWARD GRANVILLE (1862–1926), English Oriental scholar and lecturer, was born in Newcastle-on-Tyne. He studied medicine and science, but after a course of travel in Persia he abandoned the practice of science for the cultivation of Oriental languages. In 1888 he was appointed lecturer in Persian at Cambridge and in 1902–26 he was Sir Thomas Adams professor of Arabic. He published many valuable treatises, notably a Persian text of the history of the Báb, with an English translation and notes (1891), *The New History of Mirza Ali Muhammad the Báb* (1893), *Catalogue of Persian Manuscripts in Cambridge University Library* (1896), a critical edition of Dawlatshah's *Tadhkira* (1901), *The Literary History of Persia* (1903), *The Persian Revolution of 1905–9* (1910).

Browne, EDWARD HAROLD (1811–91), bishop of Ely and of Winchester, was born in Morton House, Buckingham, England. In 1832 he was a wrangler at Cambridge, in 1833 gaining the Crosse theological scholarship, in 1834 the first Hebrew scholarship, and in 1835 the Norrisian prize. From 1843 to 1849 he was vice-principal at St. David's College, Lampeter, and in 1857 vicar of Heavitree, Exeter, and canon of Exeter. In 1864 he became bishop of Ely, and in 1873 succeeded Wilberforce as bishop of Winchester, but resigned in 1890 on account of ill health. His best known works are *Exposition of the Thirty-nine Articles* (1850–3), which is a textbook for candidates for Episcopal ordination; *The Messiah* (1862); and *The Pentateuch and Elohistic Psalms* (1863), a reply to Dr. Colenso.

Browne, GEORG, COUNT VON (1698–1792), Irish soldier of fortune, was born and educated in Limerick. Owing to the Catholic Disabilities Acts he entered first the service of Germany (1725), and afterwards the army of Russia (1730), and soon distinguished himself by suppressing a revolt of the Guards against the Empress Anna. He took part in various campaigns against Poland, France, and the Turks, in the latter being made prisoner and sold as a slave. Liberated through the influence of Villeneuve, French ambassador at Constantinople, he returned to Russia, was made a general, and distinguished himself in the Swedish War (1742). At the beginning of the Seven Years' War he was severely wounded at the battle of Zorndorf. He was created a field-marshal by Peter III., and entrusted with the conduct of the war against Denmark. For the last thirty years of his life he was governor of Esthonia and Livonia.

Browne, HABLOT KNIGHT (1815–82), English book illustrator, caricaturist and water-color painter, known as 'Phiz,' was born in Surrey. He was apprenticed to Finden, the engraver, and later attended an art school in London. He was chosen by Dickens (1836–7) to illustrate the *Pickwick Papers*, then being published, signing his pictures with the pseudonym 'Phiz,' as an appropriate compliment to the author's 'Boz,' and often making his illustrations from merely verbal descriptions. Numerous examples of his work occur in other novels (by Lever and Ainsworth) and publications of the mid-Victorian era. Stricken with paralysis in 1867, he was kept from want by an annuity from the Royal Academy.

Browne, John Ross (1817–75), American traveller, was born in Ireland, and when a child was taken to America by his father, who settled in Kentucky. When eighteen years old, he made his way to New Orleans, where he worked for some time as a stenographer in the State senate. He then shipped for a long cruise on a whaler and on his return was for several years private secretary to Robert J. Walker, secretary of the treasury. After an unsuccessful trip to San Francisco, he visited Sicily and the Holy Land as a correspondent in 1851, and ten years later travelled extensively in Europe. He was U. S. minister to China (1868–9), and was at one time inspector of customs on the Pacific coast, and subsequently made investigations for the U. S. government as to the mineral resources and commerce of that region. Among his published works are *Etchings of a Whaling Cruise* (1846), *Yusef, or the Journey of the Fragi* (1853), *Crusoe's Island* (1864), *The Land of Thor* (1867), and *Adventures in the Apache Country* (1869).

Browne, Junius Henri (1833–1902), American journalist, was born in Seneca Falls, N. Y. He was graduated from St. Xavier College, Cincinnati, and engaged in newspaper work in that city until the outbreak of the Civil War, when he removed to New York, and became war correspondent of the New York *Tribune*. After various exciting adventures, he joined an expedition formed to run the Vicksburg batteries; in May, 1863, he was captured with his fellow-correspondent, Albert D. Richardson, and the two were confined for many months in various Southern prisons, finally escaping from Salisbury, N. C., late in 1864, bringing with them a list of Union soldiers who had died at Salisbury. After the war he was occupied as journalist and author, in New York City. His published works include *Four Years in Secessia* (1865), *The Great Metropolis* (1869), *Sights and Sensations in Europe* (1871), and *Women* (1889).

Browne, Maximilian Ulysses, Baron de Connus, Count of Mountany (1705–57), Austrian field-marshal, nephew of Georg, Count von Browne, was born in Bâle. He early entered the Austrian army, and took part in the wars of the Polish succession (1733–8), in Italy (1734), against the Turks (1737–9), and was appointed commander-in-chief in Silesia. He fought in the War of the Austrian Succession, and was created a field marshal in 1749. At the beginning of the Seven Years' War he was in command in Bohemia, and unsuccessfully opposed Frederick II. at Kolin (1756), and the Saxons at Pirna (1756). In 1757 he distinguished himself in the battle near Prague, but was severely wounded, and died in Prague during the ensuing siege.

Browne, Robert (?1550–1633), English clergyman, founder of the religious sect of the 'Brownists,' was born in Tolethorpe, Rutlandshire. In 1572 he became a schoolmaster in London and an outdoor preacher, afterwards gathering at Norwich and elsewhere congregations who held with their leader that the church was not so much a witness of divine truth to enlighten the world, as merely a witness against the world. He was several times arrested and imprisoned, though occasionally and successfully interceded for by his relative Cecil, Lord Burghley; but at last, for refusing to appear before a bishop when cited, he was excommunicated, and was forced to flee to Holland (1581–4). Unwilling, however, to leave the Church of England, he discontinued his agitation; and after spending many years, first (1586) as schoolmaster of Stamford, and then (1591) as rector of a church, he died in Northampton jail, to which he had been committed for assaulting a constable. Consult John Browne's *History of Congregationalism in Norfolk and Suffolk;* Dexter's *Congregationalism of the Last Three Hundred Years.*

Browne, Thomas A. See Boldrewood, Rolf.

Browne, Sir Thomas (1605–82), English physician, antiquary, and author of *Religio Medici*, was born in London. He studied in France, Italy, and Holland, receiving the degree of M.D. from the University of Leyden about the year 1633, and that of Oxford in 1637. In that year he settled in Norwich, where he practised as a physician all his life, living calmly amid the din and discord of the civil war, and maintaining an active correspondence with the antiquaries and scientists of his time. He was knighted by Charles II. in 1671. In 1840 his grave in St. Peter's, Mancroft, at Norwich, was discovered by some workmen, and his skull was placed in the hospital museum of the town. The *Religio Medici* ('Religion of a Physician') was written about 1634 for his own pleasure; but an edition having been published without his sanction in 1642, the next year he published an authorized edition, which was most successful. It reveals the pious musings of a man of simple faith on the things of spiritual life and the mysteries of the unseen. In 1646 appeared his *Pseudodoxia Epidemica, or Enquiries into . . . Vulgar and Common Errors*, though he himself was a believer in alchemy, astrology, and witchcraft. In 1658 he published his *Hydriotaphia, or Urnburial,* which for richness of diction can hardly be paralleled by any work in the English language. To this work was appended the *Garden of Cyrus*, a quaint conceit, treating of horticulture from 'Adam's time to that of Cyrus,' and showing that the quincunx, or number five, is found 'in roots of trees, in leaves, and everything.' Several tracts on morals and antiquities, attributed to him, were published (1683; new ed. 1712) after his death. There was a notable edition of Browne's works by Simon Wilkin (4 vols. 1835–36); a recent one by Charles Sayle (3 vols. 1904–1907).

Browne, William (1591–?1643), English pastoral poet, was born in Tavistock. He first attended Exeter College, Oxford, was next a student at the Inner Temple, then tutor to Robert Dormer, the future earl of Carnarvon. But little is known of his life. He was living at Dorking about the close of 1640. His great work is *Britannia's Pastorals* (books i., ii., 1613–16; reprinted 1625). A third book was printed by the Percy Society in 1852, and by W. C. Hazlitt in his collective edition of Browne's works for the Roxburghe Club (2 vols. 1868); which includes also *The Shepherd's Pipe* (1614), a collection of eclogues, a masque produced at the Inner Temple in 1615, sonnets, and 'visions' on the model of Du Bellay. Browne was an admirer and imitator of Spenser. Ben Jonson, Michael Drayton, and Selden were numbered among his friends. He wrote the epitaph, sometimes ascribed to Ben Jonson, on 'Sidney's sister.' His works were collected and printed in 1772.

Brownell, Henry Howard (1820–72), American poet, was born in Providence, R. I. He was graduated (1841) from Trinity College, Hartford, and taught school in the South for a while, but returned to Hartford, and was admitted to the bar (1844). In 1847 he published a volume of *Poems*, and after 1849 he devoted himself altogether to literary work, which up to the Civil War, comprised principally the writing of popular histories. Some spirited verses on Farragut's general orders preceding the battle of New Orleans led the admiral to invite Brownell to witness the battle of Mobile Bay as acting ensign on the *Hartford*, which he did, describing it in his best known poem, 'The Bay

Fight.' After the war he accompanied Farragut on his cruise to the ports of Europe, resigning in 1868, and returning to Hartford, where he died. Mr. Brownell published *Lyrics of a Day* (1864) and *War Lyrics, and Other Poems*, a final collection (1866). Dr. Holmes wrote warmly concerning Brownell's battle pieces.

Brownell, William Crary (1851), American author, was born in New York city, and graduated (1871) at Amherst. He was a member of the staff of the N. Y. *World* (1871–9), and subsequently art critic of the *Nation* (1879–81). After several years of travel and study abroad, he joined the N. Y. publishing house of Charles Scribner's Sons as literary adviser in 1888. He contributed occasionally to the magazines and published *French Traits: An Essay in Comparative Criticism* (1889), *French Art: Classic and Contemporary Painting and Sculpture* (1892), and *Victorian Prose Masters* (1901).

Brownhills, vil., Staffordshire, England (Brownhills for Cannock Chase), 5 m. N.N.E. of Walsall; has extensive coal mines. Pop. (1911) 16,856.

Brownian Movements, or Motions, are rapid vibratory motions observed in microscopic particles, both vegetable and mineral, when suspended in water, and first noticed by the botanist Robert Brown in 1827. The movements have often been mistaken for vital motions; but they are still apparent when the liquid containing bacteria has been sterilized. Jevons has proved that solid matter of every kind, when finely divided, gives evidence of Brownian movements.

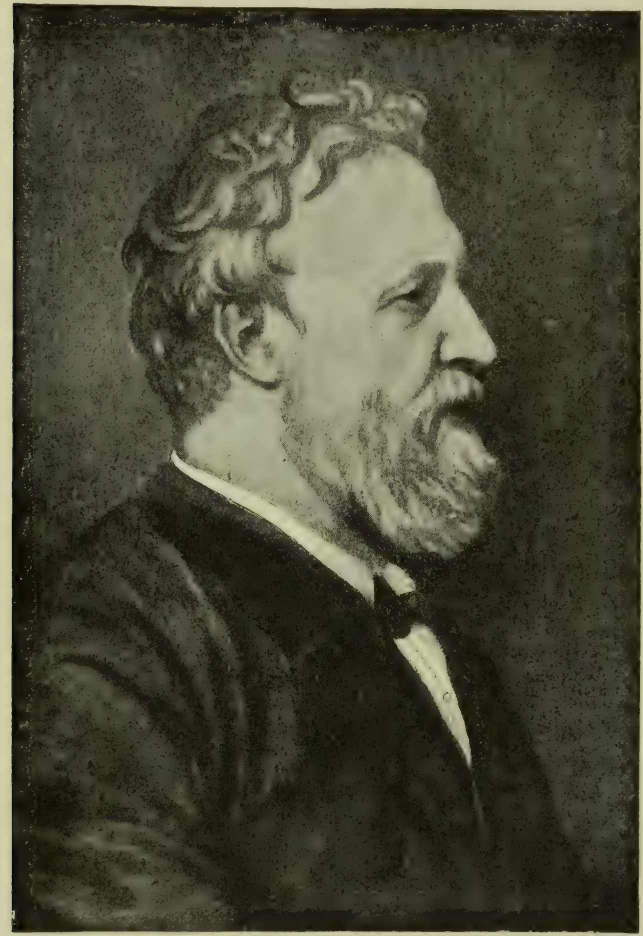
Brownie, a term in Scottish tradition signifying 'little brown one,' and applied to a race chiefly remembered as occupying a servile position in houses and on farms. A typical specimen was the brownie who lived at Strathmiglo in Fifeshire. 'Every day he used to cross the water of Miglo by stepping-stones, and acted as the useful drudge at the Tower of Cash; and all he asked in return was to feed out of any dish he chose.' Accounts vary, but the brownies are generally described as a naked people, with hirsute skins. Supernatural powers are also attributed to them. It would seem that they were an early European race, remembered in a dim and confused way by the peasantry. See Gnome, Dwarfs, etc.

Browning, Elizabeth Barrett (1806–61), English poet, was born at Coxhoe, in the county of Durham, on March 6, 1806. Her girlhood was spent at Hope End in Herefordshire. From an early age an invalid—largely due to an accident to her spine—her health gave chronic anxiety till she was thirty-four, when her nervous weakness was increased by the death of her only brother by drowning at Torquay. Six years later, however, she was (against her father's wish) married, in London, to Robert Browning, Sept. 12, 1846; and after the birth of their son, in Florence, early in 1849, she gained a fresh lease of life. For many years the Brownings lived in Florence, with intervals of residence in London and Paris, and latterly at Rome; and it was in her loved Florence, the city of her *Casa Guidi*, that, on June 29, 1861, she died, after a frail life prolonged to the fifty-sixth year by the power of love and happiness.

Mrs. Browning. From a Chalk Drawing by Field Talfourd.
(Photo by Emery Walker.)

It is often said that the most popular work of Elizabeth Barrett Browning was—even that it still is—*Aurora Leigh*. It is possible, that this famous 'novel in verse' found a wider circle of readers; it is incredible, however, that the inner circle which loves poetry for its own beauty should rank that diffuse if beautiful work, or any other of the author's longer writings, with the matchless *Sonnets from the Portuguese* (not, as implied by the title, a translation, but original with Mrs. Browning), the highest and finest expression, in English or any other literature, of a woman's love for a man. This, surely, is the lasting monument of England's greatest woman-poet. Already *Aurora Leigh* is among the masterpieces that are seldom read. Out of all the mass of Elizabeth Barrett Browning's poetry—none of it worthless, little of it uninteresting, most of it delightful, and some of it beautiful and fragrant with genius of a rare and lovely kind—one or two poems and lyrics, as the *Dead Pan* and *The Cry of the Children*, are as yet untouched by time.

Works.—*An Essay on Mind* (anonymous), and the privately-printed poem *The Battle of Marathon* (1826); *Prometheus Bound,* etc. (1883); *The Seraphim* (1838); *A Drama of Exile,* and *Sonnets from the Portuguese,* etc., collected in *Poems* (2 vols. 1844; reprinted at New York as *A Drama of Exile,* etc., 1845); *The Runaway Slave at Pilgrim's Point* (1849); *Casa Guidi Windows* (1851); *Two Poems by E. Barrett and R. Browning* (1854); *Aurora Leigh* (1856–57); *Poems before Congress* (1860). Posthumous.—*Last Poems* (1862); *The Greek Christian Poets and the English Poets* (1863); *Selected Poems,* edited by Robert Browning (2d ser. 1866, 1880); *Letters to R. H. Horne* (2 vols. 1876–7); *Earlier Poems* (1826–33, 1878). Collected Works—2 vols., New York, 1871; 5 vols., London, 1890. Life.—The most accessible monograph is that by J. H. Ingram, in the 'Eminent Women Series' (1888). See also T. H. Ward's *English Poets* (1883), Miles's *English Poets* (1899), *Dict. Nat. Biog.*, and other specialist critiques.



Robert Browning. From the Portrait by G. F. Watts, R.A.
(Photo by F. Hollyer.)

Browning, Oscar (1837), English university lecturer in history, and principal of Cambridge University Day Training College. He graduated with classical honors in 1860. From 1860 to 1875 he was assistant master at Eton. He is a leading exponent of the training of teachers. As a Liberal he contested unsuccessfully Norwood (1886), E. Worcestershire (1892), and W. Derby (1895). Chief works: *Modern England* (1879), *Modern France* (1880), *Aspects of Education* (1888), *Life of George Eliot* (1890), *Hist. of England* (4 vols. 1890), *The Citizen: his Rights and Responsibilities* (1893), *Charles* XII. *of Sweden* (1898), *Wars of the 19th Century* (1899), and many other works, mainly historical.

Browning, Robert (1812–89), by many held to be the greatest English dramatic poet since Shakespeare, and almost universally admitted to be one of the two greatest poets of the long and brilliant Victorian era, was born at Camberwell (then an outlying suburb of London), May 7, 1812. Browning had a happy childhood in a prosperous and well-ordered household, and enjoyed the careful training of affectionate and cultured parents. From boyhood he showed exceptional intellectual and literary tendencies, and when he was no more than twelve years old his father printed for him his poetic 'first-fruits,' under the title *Incondita.* He never went to a public school, nor to one of the great universities; though when his education by a private tutor was finished, he attended, during the session of 1829–30, a course of lectures at University College, London. The most important educational event in the youth of Browning was his sojourn, in his twenty-second year (1833–4), in Russia and Italy. His first publicly-printed poems appeared (above the signature 'L') in the *Monthly Repository* (1834). His earliest dramatic effort, *Strafford,* was produced by Macready at Covent Garden (May 1, 1837). From this date (by which time *Pauline* and *Paracelsus* had been published) Browning determinedly devoted himself to the art of poetry; and it is significant that the three greatest modern English poets—Wordsworth, Tennyson, and Browning—each consciously and scrupulously ordered life and circumstances to the one great end, never swerving, never despairing, never expending energy in any other direction. But the attention of the reading world was not easily won; and it must be admitted that the first important work (in the sense of size and ambition)—*Sordello* (1840)—was not likely to make way readily. Ordinary readers blamed for obtuseness by enthusiasts, may take consolation in the circumstance that Tennyson himself, friend and admirer though he was, 'could make nothing of it.' 'There are,' he declared in effect, 'only two lines in *Sordello* that I can understand

—the first and the last—and neither is true!' (*i.e.* 'Who will, may hear Sordello's story told, and 'Who would, has heard Sordello's story told'). The publication, during 1841–6, of the remarkable series of dramatic and lyrical poems, in eight parts, collectively grouped under the title *Bells and Pomegranates*, was followed by his marriage, Sept. 12, 1846, to Elizabeth Barrett (see BROWNING, E. B.), already a poet far more widely known than himself. Their union was an ideal one, and in March 1849, a son was born to them in Florence, where they had settled in the winter of 1847, and which, with several breaks of varying intervals, remained their home till the summer of 1861, when Mrs. Browning died. Following this event Browning resided in London, though with frequent and often prolonged visits to Italy. In November of 1889 he joined his son at his former home in Venice, where he died on December 12. On the last day of 1889 his body was placed in the Poets' Corner, Westminster Abbey.

The greatness of Robert Browning as a poet is beyond dispute. The spiritual secret of his mastery is revealed in his words spoken of Shelley: 'I prefer to look for the highest, not simply the high.' Great as has been his moulding influence on the character and mind of a vast number of readers—to whom perhaps, in the main, the ethics of his poetry is of more import than its verbal beauty—he has also nobly enriched our literature with verse of enduring beauty for its own sake. Among many masterpieces—from *Pippa Passes* to the *Asolando* of his old age; from the superb verse of *Paracelsus* to the last 'flute-note with an accompaniment'—we may discern the figure of one who, beyond all cavil, is a great poet. His spiritual message, as distinct from his poetic achievement, can be summed up in one line (in the prologue to *Pacchiarotto*): 'Hope hard in the subtle thing that's spirit.'

His many works include:—*Incondita* (privately printed, 1824); *Pauline* (1833); *Paracelsus* (1835); *Strafford* (1837); *Sordello* (1840); *Bells and Pomegranates* (1841–6), in eight parts —viz. 'Pippa Passes' (1841); 'King Victor and King Charles' (1842), 'Dramatic Lyrics' (1842), 'The Return of the Druses' (1843), 'A Blot in the 'Scutcheon' (1843), 'Colombe's Birthday' (1844), 'Dramatic Romances and Lyrics' (1845), 'Luria,' and 'A Soul's Tragedy'' (1846); *Christmas Eve and Easter Day* (1850); *Two Poems by E. Barrett and R. Browning* (1854); *Men and Women* (2 vols. 1855); *Dramatis Personæ* (1864); *The Ring and the Book* (4 vols. 1868–69); *Balaustion's Adventure* (1871); *Prince Hohensteil-Schwangau* (1871); *Fifine at the Fair* (1872); *Red Cotton Night-cap Country* (1873); *Aristophanes' Apology* (1875); *The Inn Album* (1875); *Pacchiarotto* (1876); *La Saisiaz* and *The Two Poets of Croisic* (1878); *Dramatic Idylls* (2 ser. 1879–80); *Jocoseria* (1883); *Ferishtah's Fancies* (1884); *Parleyings with Certain People* (1887); *Asolando* (1889–90). Collected editions of his complete works were published in 1895, 1898, 1909 and 1912.

Besides his original writings, Browning published a translation of the *Agamemnon* of Æschylus (1877). He also edited the forged *Letters of Shelley* (1852), *Selections from Mrs. Browning's Poems* (1866 and 1880), Mrs. Browning's *Poetical Works* (1889–90), and (in 1884) Rev. T. Jones' *The Divine Order*. Consult Chesterton's *Robert Browning;* Cooke's *A Guide Book to the Poetic and Dramatic Works of Robert Browning;* Clarke's *Browning and his Century;* Douglas' *Robert Browning;* Griffin's *The Life of Robert Browning;* Orr's *Life and Letters of Robert Browning;* Phelp's *Robert Browning; How to Know Him* (1915); Hermann's *The Faith of Robert Browning;* Sim's *Robert Browning, the Poet and the Man* (1923).

Brownists. See BROWNE, ROBERT.

Brownlow, WILLIAM GANNAWAY (1805–77), American journalist, was born in Wythe County, Va. He was self-educated and from 1826 to 1836 was an itinerant Methodist preacher. In 1838 he became editor of the Knoxville, Tenn., *Whig*, which he conducted so aggressively as to be known as 'the fighting parson.' He was an advocate of slavery, but was opposed to secession and for this reason his paper was suppressed by the Confederate authorities in 1861 and the following year he was sent within the Union Lines. After the war he was reconstruction governor of Tennessee for two terms, and served as United States senator from that State, 1869–75, returning to Knoxville and the editorship of the *Whig*, at the expiration of his term. His publications include a book describing his ante-bellum experience and several brochures.

Brown-Sequard, broun-sā-kär', CHARLES EDWARD (1817–94), physician and physiologist, was born in Mauritius, his father being a native of Philadelphia, and his mother French. He was graduated M.D. at Paris in 1840, and devoted himself to physiological investigations, making numerous discoveries in the composition of the blood, animal heat, the spinal column and its maladies, the muscular system, and especially the nervous system. After acting (1859–63) as physician to the Hospital for the Paralyzed and Epileptic in London, he went to the United States, becoming professor of physiology and pathology at Harvard University, 1864–8. He returned to Paris in 1868, and became professor of pathology (1869–72), in the Faculty of Medicine but went again to the United States, practicing medicine in New York City, 1873–8. In 1878 he succeeded Claude Bernard in the chair of experimental medicine at the College de France, Paris. In addition to many essays and memoirs, he published *Lectures on Physiology and Pathology of the Nervous System* (1860) and *Lectures on the Diagnosis and Treatment of Paralysis of the Lower Extremities* (1861).

Brown'son, ORESTES AUGUSTUS (1803–76), American author and theologian, was born in Stockbridge, Vt. He was successively a Presbyterian, a Universalist, a Deist, and finally became a Roman Catholic. In 1838 he founded the *Boston Quarterly Review*, afterwards *Brownson's Quarterly Review* (1844–64), in which most of his writings appeared. He was a clear and vigorous writer, sincere in his beliefs in spite of frequent changes. His works include *Charles Elwood, or the Infidel Converted* (1840), an account of his religious experiences; *The Spirit-rapper: an Autobiography* (1854); *The Convert, or Leaves from my Experience* (1857); *The American Republic: Its Constitution, Tendencies, and Destiny* (1870). His collected works were published (1882–1907), and a *Life* (1898–1900), by his son, Henry F. Brownson.

Brown Spar, in mineralogy, a term applied to any light carbonate of lime, tinged by, or combined with, oxide of iron, such as ankerite, dolomite, magnesite, or siderite.

Browntail Moth, a European moth (*Euproctis Chrysorrhœa*) whose larvæ are exceedingly destructive to apple, pear, plum, oak, willow, elm, and maple trees. The adult female is pure white except the tip of the abdomen which is brown. Aside from its propensity to devour foliage the microscopic hairs on its body are often exceedingly poisonous to some people, producing a dermatitis similar to that caused by poison ivy. It was first noticed in the United States in Somerville, Mass., in 1897 and methods were at once devised for its extermination. Cutting and burning of the winter webs before the caterpillars emerge in April, and spraying with arsenate of lead in mid-summer, are both effective means of control.

Brownsville, city, Tennessee, county seat of Haywood County, on the Louisville and Nashville Railroad; 55 miles northeast of Memphis. It is the seat of the Brownsville Training School for Boys, established in 1900. It is in a fertile fruit growing region and has manufactures of chemicals, flour and cotton products. Pop. (1910) 2,882; (1920) 3,062.

Brownsville, city, Texas, county seat of Cameron County, on the Rio Grande River, opposite Matamoros, Mexico, and on the Missouri Pacific and the Rio Grande Railroads. It has steamboat connection with Galveston and extensive trade with Mexico. Features of interest are the Courthouse, Customs House, the Roman Catholic Cathedral, and a Roman Catholic convent. It attracted country-wide attention on account of a shooting affray on August 14, 1906, when a party of men believed to be members of the Twenty-fifth U. S. Infantry (colored), stationed there, after much indiscriminate shooting killed one man. After failing to discover the real culprits President Roosevelt dishonorably discharged three companies of the regiment for this outrage, causing considerable bitter criticism. Pop. (1920) 11,791.

Brown University, an institution of higher learning in Providence, R. I., chartered in 1764. It owed its origin to the disabilities attaching to Baptist students in most of the existing American colleges, but, although by its charter a majority of its fellows and trustees must be Baptists, all religious tests and sectarian instruction are prohibited. In 1765 the college, originally called Rhode Island College, was opened at Warren, where the first president, James Manning, had established a Latin school, but in 1770 removed to its present site in Providence. Its work was interrupted by the Revolution, during which University Hall was used as a barracks and hospital for American and French troops. In 1804 the name was changed to Brown University in honor of Nicholas Brown, a generous benefactor.

During the presidency of Francis Wayland, D.D., 1827–1855, the university was reorganized and greatly developed. Under the presidency of E. Benjamin Andrews, D.D., 1889–98, the number of departments was rapidly increased, old departments were expanded, and important additions were made to grounds and buildings. The Women's College, founded in 1891, became part of the university in 1897. It has its own dean, campus and buildings and is related to the university only through a common board of trustees and teaching staff. In the régime of William H. P. Faunce, D.D., LL.D., 1899– , the student body has been more than doubled, the endowment has been increased to nearly ten million dollars and such noteworthy buildings as the John Carter Brown Library of American History, the John Hay Library, the John R. Hegeman Hall of Residence, Rockefeller Hall, the Jesse Metcalf Chemical Laboratory and the Marston Hall of Languages have been added to the physical plant.

The university confers the degrees of A.B., PH.B., B.S. (in engineering and chemistry), B.ED. (in the School of Education), A.M., SC.M., M.B.A. (Master of Business Administration); PH.D., and D.P.H. (Doctor of Public Health). There are many scholarships for undergraduate work, several fellowships, and a loan fund available to needy students.

The John Hay Library and the department libraries contain more than 350,000 volumes. The John Carter Brown Library has the most complete collection in the world on the colonial history of North and South America. The McLellan Lincoln Collection is a close rival to the Lincoln Collection in the Library of Congress; and the Harris Collection of American poetry is among the finest of its kind. Other outstanding collections are the ones relating to Dante and Napoleon. For recent statistics see Table under the heading COLLEGE.

Brownwood, city, Texas, county seat of Brown County, on a tributary of Colorado River, and on the Gulf, Colorado, and Santa Fé and the St. Louis-Fort Worth and Rio Grande Railroads; 125 miles northwest of Austin. It is the seat of Daniel Baker College (Presb.) and Howard Payne College (Bapt.). Manufactures include cotton and woollen goods, cotton seed oil, and flour, and there is an extensive export trade in wheat, hides, wood, pecan nuts, and petroleum. Pop. (1910) 6,967, (1920) 8,223.

Bruay, brü-ā, mining town, France, in the department of Pas-de-Calais, 6 miles southwest of Béthune. It is one of the few mining towns which remained in French hands during the Great War. Pop. (1921) 29,710.

Bruce. See ELGIN and KINCARDINE, EARLS OF.

Bruce, BLANCHE KELSO (1841–98), negro public official, was born a slave, of African descent, in Prince Edward County, Va. He was educated with his master's son and at the opening of the Civil War left the plantation, taught school in Missouri, studied at Oberlin, O., and by 1869 was a successful planter in Mississippi. He filled several local and State offices until 1875, when he was elected U. S. senator from Mississippi, being the second colored member in the National Senate. He was register of the U. S. treasury, 1881–5, and 1897–8, and in 1890 was appointed recorder of deeds for the District of Columbia.

Bruce, DAVID (1324–71), Scottish king, son of Robert Bruce (q.v.), whom he succeeded in 1329, when a mere child. In 1333 he was sent to France by his guardians but returned to Scotland in 1341 and soon made several unsuccessful raids into England. He was taken prisoner in 1346 and confined in the Tower of London, whence he was removed to Odiham, where he remained until 1357. He had no decendants and his later years were marked by various intrigues with England regarding his successor to the throne. Consult Dunbar's *Scottish Kings.*

Bruce, JAMES (1730–94), Scottish traveller, was born in Kinnaird, Stirlingshire. He was educated at Harrow, studied law, and after a brief career in business, in 1762 obtained a consulate in Algiers. After some two years during which he was involved in a series of disputes with the Algerian dey, he resigned, and in 1765 set forth on an archæological tour through Barbary. In 1768 he undertook a journey to Abyssinia, and in November, 1770, found the sources of the Bahrel-Azrek, or Blue Nile, which was considered the main stream of the Nile. After remaining in Abyssinia about two years he made his way back to Alexandria. Returning to Scotland, he prepared for publication his *Travels to Discover the Sources of the Nile,* which appeared in 1790, in five large quarto volumes. His general accuracy, which was at first considered doubtful, has been verified by later travellers. Consult Murray's *Life of James Bruce* (1808).

Bruce, MICHAEL (1746–67), Scottish poet, was born in Kinnesswood, Kinross-shire. After attending Edinburgh University he became a school-master. His reputation rests mainly on the poem *Ode to the Cuckoo,* and on certain versified renderings of Scriptural passages included in the Scottish Paraphrases; but his claim to the latter has been disputed by David Laing and J. Small, in favor of John Logan, a college associate, who edited his *Poems on Several Occasions* (1770). The question has given rise to a long and heated controversy, but the balance of authority is in favor of Bruce. See the *Lives* by Mackelvie (1837), Grosart (1865), and Stephen (1895).

Bruce, ROBERT (1274–1329), king of Scotland, belonged to the Norman family De Bruis, which, in the person of Robert de Bruis, came to England with the Conqueror in 1066. This knight received large grants of land, chiefly in Yorkshire; and his son Robert, who was an associate of the prince who afterwards became David I. of Scotland, obtained the lordship of Annandale. The family thus held lands in both kingdoms, and this fact is the explanation of the somewhat tortuous policy pursued by them, as well as by others of the Norman barons whom David introduced into Scotland. At the battle of the Standard (1138), Robert Bruce, who had received the original grant of Annandale, fought on the English side; while his son, the third Robert, fought under David, and was taken prisoner, it is said, by his own father. The fifth lord of Annandale, Robert de Bruis (1210–95), was a competitor with John Baliol for the crown of Scotland in 1290, claiming the honor as a son of the second daughter of David I. But in 1292 Edward I. awarded the crown to Baliol; and Bruce, to avoid recognition of his rival's claims, resigned to his son, Robert de Bruis (d. 1304), his Scottish lordship of Annandale. This sixth lord in turn did fealty to Edward I., and fought on the English side when Baliol was forced to throw off the English yoke. He claimed the throne which Baliol relinquished; but Edward refused, and the claims of the house of Bruce were inherited by his son, the greatest of the family, ROBERT BRUCE, who at first followed the family policy. In 1296 he swore allegiance to Edward I.; but he 'changed sides so often that it is difficult to follow his devious career.' In any case, the year 1306, which saw him finally break with Edward I., was the beginning of the salvation of Scotland. What the circumstances were which led him at Dumfries to murder Comyn, a nephew of Baliol, and a rival for the Scottish crown, are not clearly known; but the event meant at once a complete break with Edward I., who had favored Comyn, and the hostility of half of Scotland which held by Comyn. But from 1306 Bruce faced the difficulties of his situation, and gradually won, by his ability and his success, the esteem and confidence of the people of Scotland, who had known many years of Edward's 'resolute' government. At first fortune was against him. He had himself crowned at Scone, where the poverty of his support was painfully apparent; but within a few months he was surprised at Methven, and defeated in the Highlands by the Lord of Lorn, an uncle of the murdered Comyn, and was forced to withdraw from Scotland and winter in the island of Rathlin, off the north coast of Ireland; while, to complete his misfortunes, his wife and his daughter Marjory were captured by the English, and his brother Nigel and many of his supporters were executed as traitors.

In 1307 the tide turned. Bruce landed at Turnberry, in Ayrshire, defeated the Earl of Pembroke at Loudon Hill, and made good his footing again in Scotland; and the great Edward I. died in the same year, and was succeeded by Edward II., who was incompetent to carry on the war against such a military leader as Bruce now proved himself to be. District after district owned Bruce's authority; castle after castle fell into his hands. English armies of invasion were checked by his policy of devastating the country before them; and the Scots soon gained strength and confidence enough to make counter-raids into England. In 1310 the Scottish clergy declared him their lawful king, and thus the ban of excommunication which rested on him was practically removed, and in 1313 Stirling Castle alone resisted his authority. This stronghold was sorely pressed by the king's brother Edward, who was induced rashly to accept a promise of its peaceful surrender if it was not relieved by the English before June 24, 1314. This meant a pitched battle between the two nations, on a site prescribed by the necessity of keeping the English out of Stirling, and the result was the disastrous defeat of the English at Bannockburn. From 1314 Scotland was free, and Bruce devoted himself to securing the formal recognition of the sovereignty he had won. He had to deal not only with obstinacy on the part of England, but with the influence of the Pope, who favored the English; but eventually he achieved his purpose, and by the treaty of Northampton (1328) the independence of Scotland was acknowledged. The ultimate success of Scotland resulted from his policy of carrying on offensive war against England in the northern counties and in Ireland. The king's brother Edward, who had been offered the Irish crown by the chieftains of Ulster if he would assist them in expelling the English, landed on the island in May, 1315, and soon broke the power of the English. He was crowned king of Ireland after his victories in Ulster, but was himself killed at Dundalk in 1318.

Robert Bruce was as wise a king in peace as he was brave and skilful in war, and his policy was directed to the restoration of Scottish prosperity, and to the safeguarding of the land against English aggression. He encouraged the burghs, and first gave them a place in the Scottish Estates (Cambuskenneth, 1326); and he had the power to carry out as well as the wisdom to devise. His career may be summed up in the words of Professor Hume Brown: 'At the beginning of his great enterprise the probability is that he was prompted solely by the desire of making good the claims of his own house. But as his work grew and prospered he rose to the conception of a true patriot king.' He died at Cardross of leprosy in 1329, and was succeeded by his infant son David II. By his will his heart was to be buried in Jerusalem. It was entrusted to Sir James Douglas to carry thither; but Douglas was killed fighting against the Moors in Spain. Bruce's heart was saved, and being brought back to Scotland, was buried in Melrose Abbey.

Brucea, a genus of Simarubaceæ, named in honor of the Abyssinian traveller, J. Bruce. It consists of shrubs with compound leaves, flowers in heads, four-merous flowers, succeeded by four drupes. The species are natives of Abyssinia, China, etc., and some of them possess properties similar to quassia, the seeds of *B. sumatrana* being used locally as a remedy for dysentery.

Bruch, MAX (1838), German violinist, composer, and conductor, was born at Cologne. In 1865 he became director of the Musical Institution at Koblenz. From 1871 to 1873 he lived in Berlin, and afterwards at Bonn, devoting himself almost exclusively to composition. In 1878 he twice visited England, and in 1880 he succeeded Benedict as conductor of the Liverpool Philharmonic; but in 1882 he returned to Breslau, and in 1889 to Berlin. In 1883 he visited the U. S. where, at Boston, he conducted his oratorio *Arminius*. This one of his compositions is extremely popular in the U. S., having been sung twice at the Worcester (Mass.) festivals, and has also been heard in Philadelphia. His popularity rests upon his compositions for choir and orchestra, of which nearly a dozen have enjoyed great favor, as *Szenen aus der Frithjofsaga*, *Schön Ellen*, *Odysseus*, *Arminius*, *Lied von der Glocke*, *Römischer Triumphgesang*, *Wessobrunner Gebet*, *Normannenzug*, *Salamis*, *Thermopylä;* though he has also written two operas—*Lorelei* (1863) and *Hermione* (1872)—music for Schiller's *Jungfrau von Orleans*, and many religious and secular pieces, including violin concertos and symphonies.

Bruchsal, tn. and important railway junction, grand-duchy of Baden, Germany, 21 m. s. of Heidelberg. It was formerly the residence of the archbishops of Spires, whose palace still remains. There is a large convict prison. Pop. (1900) 13,555.

Brucine, or DIMETHOXY-STRYCHNINE ($C_{23}H_{26}N_2O_4$), is an alkaloid present in nux vomica and St. Ignatius's bean. It is a colorless crystalline solid, with a very bitter taste and similar properties to strychnine; but it is less poisonous, and gives a red color with nitric acid.

Brucite, a magnesian mineral associated with the serpentines; recently shown to be an important rock-forming mineral in this group. It is a soft, flaky mineral with pearly lustre and composition MgO_2H_2. The fibrous variety is called Nemalite. It is abundant in the serpentines of Hoboken, N. J., from which locality it was first described in 1814—named after Col. Bruce.

Brucker, JOHANN JAKOB (1696–1770), German historian of philosophy, born at Augsburg; became a minister of the Reformed Church, but soon abandoned preaching for literature His most important work is *Historia Critica Philosophiæ* (1742–44; new ed. 1766-7), a work of immense labor and high reputation; a portion of it was translated into English by W. Enfield (1837). In addition to this he wrote various other learned works, such as *Pinacotheca Scriptorum nostra Ætate Literis Illustrium* (1741-55), etc.

Brückner, ALEXANDER (1834–96), Russian historian of German descent, born in St. Petersburg; was professor of history at the law school in St. Petersburg from 1861–7, and in 1872 was appointed professor of Russian history at the University of Dorpat, but lost the appointment when the university was Russified in 1891. Among his works are *History of the Russo-Swedish War from* 1788–90 (1869, in Russian); *Kulturhistorische Studien: die Russen im Ausland, die Auslander in Russland im* 17 *Jahrhundert* (1878); *Beiträge zur Kulturgeschichte Russlands im* 17 *Jahrhundert* (1887); *Die Europäisierung Russlands* (1888). He has also contributed the monographs *Peter der Grosse* (1879) and *Katharina II.* (1883) to Oncken's collection *Weltgeschichte in Einzeldarstellungen.*

Bruckner, ANTON (1824–96), Austrian organist and musical composer, was born at Ansfelden, Upper Austria. In 1868 he was appointed organist of the imperial chapel at Vienna; professor at the conservatorium, and in 1875 lecturer on music at the university. Of his compositions, the best are his religious works—*e.g.* two masses, a *Te Deum*, etc. He has also written nine symphonies showing an ultra-Wagnerian tendency. His romantic symphony in E flat (No. 4) was given by the Philharmonic Society in New York, in March, 1888, his symphony in D minor by the Symphony Society in 1885, and in 1886 the Philharmonic Society performed the E major symphony (No. 7).

Brudenell, JAMES THOMAS. See CARDIGAN, EARL OF.

Brüdergemeinde. See MENNONITES; MORAVIANS.

Brüderhof. See MENNONITES.

Brueghel. See BREUGHEL.

Brueys, DAVID AUGUSTIN DE (1640–1723), French dramatist and theologian, was born at Aix. Educated in the religious principles of the Calvinists, he engaged in controversy on their behalf; but being converted by Bossuet, he entered the Roman Catholic Church, and wrote religious pamphlets from the new standpoint. He is best remembered by his plays, some of them written in collaboration with Jean Palaprat (1650–1721), the chief being *Le Concert Ridicule* (1689), *Le Grondeur* (1691), *Le Muet* (1691). By himself De Brueys wrote *Gabinie* (1699) and two or three other plays (some never performed), including *L'Avocat Patelin* (1706). His dramatic works were published in two volumes in 1712.

Bruges (Flem. *Brügge*), tn. and episc. see of Belgium, chief tn. of W. Flanders, 63 m. N.W. of Brussels and 8 m. inland from the North Sea, with which it is connected by two canals leading to Ostend and Sluis respectively, and by a third and much larger (230 ft. wide and 26½ ft. deep) one formally opened in 1907 at a cost of over $7,500,000 to Heyst. From the 12th to the 16th century Bruges was the largest commercial city in the north of Europe, a centre for the English and Scandinavian trade as well as the emporium of Hanseatic and Venetian and other Italian merchants, and had at the height of its prosperity a population of 200,000. At the present time it is a quiet, quaint mediæval place, traversed by canals, with small houses turning their gable ends towards the streets, and a great number of charitable and religious asylums, hospices, refuges, etc. The present cathedral (St. Salvator)—the old cathedral was destroyed by the French in 1799—is of all periods between the 12th and the 19th century. The church of Our Lady, also dating from the 12th century, contains the fine tombs of Charles the Bold, Duke of Burgundy, and his daughter Mary, wife of the Emperor Maximilian. Both churches, and also the church of St. James (13th to 19th century), are adorned with notable Flemish pictures; but the most valuable works of this description in Bruges are the small collection of Memlinc's pictures in the hospital of St. John. Amongst other public buildings are the Gothic town hall (14th century); the town chancellery (16th century); the famous belfry of Bruges (353 ft. high), built between the 13th and the 15th century, but equipped with its present carillon only in 1743; the museum and picture gallery, with valuable Flemish pictures; the museum of antiquities in the Gruuthuuse, a 15th-century structure; the 14th-century (Poorters Loge) archives, the municipal library, a former palace of the dukes of Burgundy, the law courts (with a magnificent 16th-century fireplace), the chapel and museum of the Sacred Blood (12th century), and the Beguines' house (13th century). In the lower part of the belfry is an archæological museum. Pop. (1838) 44,374; (1900) 51,657. The foundation of Bruges goes back to before the 7th century. Its citizens played a prominent part in the bloody 'Flemish Vespers,' and the succeeding defeat of the French

The Belfry of Bruges.

at Courtrai (1302). In the 15th century the sanding up of the seaway to and at Sluis, the growth of Antwerp, and the shifting of the centres of European commerce brought about by the discovery of America and the sea route to India, tended (with certain political causes) to weaken and destroy the commercial supremacy of Bruges. The independent yet turbulent spirit of its people was shown in 1488, when they kept prisoner for some months the Roman king (afterward emperor) Maximilian, and forced him to abdicate the government of Flanders. See W. C. Robinson's *Bruges* (1900).

Brugsch, HEINRICH KARL (1827–94), German Egyptologist, was born at Berlin. He was sent by the Prussian government to Egypt in 1853, where he joined Mariette in the Memphis excavations. Appointed assistant curator of Berlin Egyptological Museum (1855), he visited Persia in 1860, and acted as German consul at Cairo (1864–8), returning to the chair of Oriental languages at Göttingen. In 1870 he became head of the Khedive's school of Egyptology at Cairo. He visited the U. S. in 1876 as representative of the Egyptian Government to the Centennial Exposition in Philadelphia. On grounds of economy he was dismissed from his post in 1879, and afterwards resided principally in Germany, making a visit to Persia in 1884 as member of a German embassy, and again visiting Egypt on behalf of the Prussian government. He died at Charlottenburg. Of his numerous works on Egyptology (over thirty), the most important are *Egypt under the Pharaohs* (1877; trans. 1880); *Dictionnaire Géographique de l'Ancienne Egypte* (1877–80); *Thesaurus Inscriptionum Ægyptiacarum* (1882–91); *Religion u. Mythologie der alten Ægypter* (1884–8). See his *Mein Leben u. mein Wandern* (1894).

Brühl, HEINRICH, COUNT VON (1700–64), prime minister of Augustus III., elector of Saxony and king of Poland, whose position on the throne was established (1733) mainly by Brühl's assistance. From that date to 1746 he gradually got into his own hands the principal offices of state, and from 1746 ruled Saxony in his master's name. He brought the country to the verge of ruin, involving it in a war (1756–63) with Frederick II. of Prussia, who took his capital. After the death of the Elector Augustus, Brühl, dismissed by his successor, survived his master only three weeks. Brühl amassed great wealth, and his collection of 62,000 volumes forms part of the royal library at Dresden. See two anonymous biographies, *Leben des Grafen von Brühl* (1760–1), and *Zuverlässige Lebensbeschreibung d. Grafen von Brühl* (1766).

Bruises are the result of laceration of subcutaneous tissues, the skin itself being unbroken. They commonly result from direct violence, such as a blow with a blunt weapon, a crush, or a pinch, but are also produced by sudden, violent muscular efforts. The softer the flesh the more easily it is bruised, and fatty tissues bruise easily; some diseases, such as anæmia, scurvy, and hæmophilia, predispose to it. In a bruise the discoloration is caused by hæmorrhage from capillaries and other small blood-vessels, the changes in color arising from the different stages of blood disintegration and absorption. In the case of a bruise of the eyeball the discoloration is red, the blood keeping its arterial color.

Medico-legal investigations frequently involve the question of bruising before and after death. It is held that a body may be bruised at any time within two hours after death, but far greater violence is necessary then than would be the case before death. A bruise visible on the surface, and produced before death, would be accompanied by more or less swelling; and on incision coagulated blood would be found, with discoloration of the skin proper. A body bruised after death shows no swelling; and on cutting into the bruise little coagulated blood is found, and the skin is not blackened. It must also be remembered that in the case of a deep-seated injury, received shortly before death, there might be no external sign; though, on cutting down, the hæmorrhage of a severe bruise might be found. A bruise may be distinguished from the post-mortem stain, due to hypostasis, by incision, when the bruise will show coagulated blood, and the post-mortem stain only a few bloody points. The position of the discoloration will also help a decision; for hypostasis is produced by gravitation, and occurs at those points upon which the weight of the dead body has been for some time pressing.

Treatment of a bruise depends upon the stage which it has reached. If firm elastic pressure can be applied immediately after the injury and maintained for twenty-four hours, the discoloration will be comparatively slight. The popular remedy of a piece of beef-steak applied to a bruised eye owes its virtue to the elasticity with which the raw meat can be fitted accurately into the orbit, and presses equally on the loose tissues of the eyelids, where otherwise blood would find its way. A cold compress, say of lead lotion, is also useful, as helping toward coagulation and the stoppage of further subcutaneous hæmorrhage. Later, or if the bruise is already fully developed, frequent gentle massage over the part will greatly hasten the removal of the coagulated blood, and consequently of the disfigurement. Free movement of the part will also help, once the bruise has developed; but perfect rest is necessary if pressure has been applied with the view of preventing discoloration. In very severe cases of bruising, amounting practically to crushing, the flesh is sometimes so severely damaged as to be the seat of gangrene.

Brulov, or BRYLOFF, CONSTANTIN PAVLOVICH (1799–1852), Russian painter, born at St. Petersburg; spent six years in Italy, where he made copies from Raphael for the imperial house, especially good being the reproduction of the *School of Athens* (now in the St. Petersburg Academy). Between 1830 and 1833 he executed one of his greatest works, *The Destruction of Pompeii* (now in the Hermitage, St. Petersburg), and in 1834 the *Death of Inez de Castro* (now in the St. Petersburg Academy). On his return to Russia he was appointed (1836) professor at the St. Petersburg Academy. To this period belongs the great canvas *The Siege of Pskov* (now in the St. Petersburg Academy); but he confined his activity chiefly to portraiture and sacred painting, the most notable results being an *Assumption* (in the cathedral of St. Petersburg) and *The Apostles* and other frescoes (in the cathedral of St. Isaac at St. Petersburg). See Muther's *Hist. of Modern Painting* (1895–6).

Brumaire, the second month of the year in the French republican calendar, extended from October 22 to November 20 in the years I.–III. and V.–VIII. The 18th Brumaire of the eighth year of the republic (Nov. 9, 1799) is the date on which Napoleon overthrew the Directory and became first consul.

Brummell, GEORGE BRYAN (1778–1840), or BEAU BRUMMELL, English leader of fashion, was a friend of George IV. when prince regent. Owing to his gambling losses he fled (1816) to Calais, where he renewed his old course of life, and in Caen was cast into prison for debt; but being released, he was appointed consul (1830–2) at Caen, where he died in a lunatic asylum. Brummell is remembered for his readiness in repartee and for his fastidious neatness in dress, in which, however, he was not extravagant and foppish, but studiously moderate.

See Jesse's *Life of G. Brummell* (1844; new ed. 1886), Fitzgerald's *Life of George IV.* (1881), Bulwer's *Pelham* (1880), and Lister's *Granby* (1826).

Brunanburh, a place in the north of England, where Athelstan and his brother Eadmund, in 937, won a decisive victory over Anlaf of Dublin, Constantine of Scotland, the Celtic king of Northumberland, and the Northumbrian Danes, the battle practically establishing the unity of England for many years. The site of Brunanburh is uncertain, but it has been variously located in Northumbria, in Yorkshire, Bamber Bridge in Lancashire, and Brunswark or Birrenswark in Dumfriesshire. The battle was commemorated by a stirring alliterative ballad contained in the Anglo-Saxon Chronicle, and in the *Saga of Egil Skallagrimsson* (trans. by W. G. Green, 1893). The most spirited version is that of Lord Tennyson.

Brunck, Richard François Philippe (1729–1803), one of the greatest classical scholars of the 18th century, was born at Strassburg. After serving for some time in the Seven Years' War (1756–63), he took up (1760) the study of Greek, and from 1776 devoted the greater part of his income as receiver of taxes to the issue of editions of the Greek authors, with emendations of the text. These included *Analecta Veterum Poetarum Græcorum* (1772–6), *Anacreon* (1778), *Apollonius Rhodius* (1780), *Aristophanes* (1781–3), *Gnomici Poetæ Græci* (1778), and *Sophocles* (1786–9).

Brundusium. See Brindisi.

Brune, Guillaume Marie Anne (1763–1815), marshal of France under Napoleon, served in the army of the revolution under Dumouriez (1793). After establishing the Helvetic republic in Switzerland and the Batavian republic in Holland, and defeating the Duke of York at Bergen in Holland (1799), he was deputed in 1800 to suppress the Chouan rebellion. In the same year he was named commander-in-chief in Italy, and defeated the Austrians on the Mincio. In 1803 he was sent as ambassador to Constantinople, and during his absence was created (1804) a marshal. He was appointed French governor of the Hanseatic League towns in 1806, and captured (1807) Stralsund and Rügen. At Napoleon's first abdication he joined Louis xviii., whom he deserted during the Hundred Days, but rejoined after Waterloo. He was murdered at Avignon by a royalist mob (1815). See *Vie de Brune* (1887); and Marmoiton, *Le Maréchal Brune* (1900).

Brunei, British protectorate in N.W. Borneo, between British N. Borneo and Sarawak. It was until 1888 an independent (Mohammedan) territory, and its sultan was at one time overlord of the whole island. The population is estimated at about 50,000. Area, 15,000 sq. m. Brunei, the capital, is mostly built on piles. The chief export is sago.

Brunel, Isambard Kingdom (1806–59), English civil engineer, was the only son of Sir Marc Isambard Brunel. He entered his father's office in 1823. He assisted in the two great undertakings—his father's block machinery and the Thames Tunnel (1825–43). Upon his own account he constructed (1831) Monkwearmouth Docks, and many other works of a similar character; and he designed (1831) the plans for the Clifton Suspension Bridge, though the bridge was not completed (1864) until after his death. His last great railway undertaking was the Royal Albert Bridge of the Cornwall Railway at Saltash (1853–9). Brunel was also one of the pioneers in the development of ocean steam-navigation. He designed the *Great Western* steamship, which was the first to make regular voyages (1838) across the Atlantic. He next built the *Great Britain*, the first large iron steamship which was navigated (1845) by the screw propeller. Under the auspices of the Eastern Steam Navigation Company, he began (1853) the construction of the huge *Great Eastern.* See the *Life of I. K. Brunel*, by his son, Isidore Brunel (1870).

Brunel, Sir Marc Isambard (1769–1849), English engineer, was the son of a farmer and landowner in Normandy. Obliged to leave France in 1793 on account of his royalist opinions, he came to the U. S. and settled in New York as a civil engineer and architect. He was engaged in the survey of a canal between Lake Champlain and the Hudson River, designed and constructed the Bowery Theatre in New York, was appointed chief engineer of that city and prepared plans for its defence. In 1799 he returned to England, and persuaded the Admiralty to accept his designs for making ship blocks by machinery. The invention was perfected in 1806, and Brunel was awarded £17,000. In 1824 the Duke of Wellington accepted his plan for the construction at London of a tunnel beneath the bed of the Thames. The work was completed in 1843, with the assistance of his son. Brunel's inventions included machines for knitting, for ruling paper, for manufacturing nails, for making druggists' boxes, and for making seamless shoes for the army. See Beamish's *Memoirs of Sir Marc Brunel* (1862).

Brunelleschi, Filippo (1377–1446), Italian architect and sculptor, was born at Florence. He promoted the restoration of the ancient classical style of architecture as a substitute for Gothic. His first great work was the church of San Lorenzo in Florence; and in 1418 he became architect of the unfinished cathedral of Florence, for which he designed the great dome, the largest in the world, imitated by Michael Angelo in the design for that of St. Peter's. He was also the architect of the Pitti Palace, and of the chapel of the Pazzi, Florence. See *Life*, by Manetti (ed. Milanesi, 1887); and Scott, *F. di ser Brunelleschi* (1901).

Brunetière, Ferdinand (1849–1906), born at Toulon, member of the French Academy from 1893, is generally acknowledged to be the most influential of recent French critics. After 1875 he contributed regularly to the *Revue des Deux Mondes*, of which he was editor. His articles have been collected from time to time in series, entitled *Etudes Critiques sur l'Histoire de la Littérature Française* (6 vols. 1880–98), *Questions de Critique* (2 vols. 1889–90), *Essais sur la Littérature Contemporaine* (2 vols. 1892–5), and *Histoire et Littérature* (3 vols. 1884–87). He confirmed his reputation and achieved considerable popularity by four series of lectures dealing respectively with *Evolution des Genres dans l'Histoire de la Littérature* (1890), *Epoques du Théâtre Francais* (1892), *Evolution de la Poésie Lyrique en France au XIX^e^ Siècle* (2 vols. 1893; 3rd ed. 1900–1), and *Bossuet* (unpublished). He lectured in the U. S. in 1897. His work is characterized by wide and accurate knowledge, and it would be difficult to find his equal in tracing a tendency in literature, or in stating an author's relationship to his predecessors. He is an extreme classicist, holding that French literature attained its perfection in the reign of Louis xiv., and that earlier literature was but a preparation, and subsequent literature a decadence. He has, accordingly, hardly done justice to the middle ages, and, on the other hand, has not ceased to oppose, since his *Roman Naturaliste* (1883), the realistic school of modern literature. In his later years he wrote, though with little success, on moral and political questions. He will be best remembered by his application of the theory of evolution to the study of literature. His later publications include *La Science et la Religion* (1895); *Education et Instruction* (1895); *La Renaissance de l'Idéalisme* (1896); *La*

Moralité de la Doctrine Evolutive (1896); *L'Art et la Morale* (1898); *L'Idée de Patrie* (1897); *Les Ennemis de l'Ame Française* (1899); *Manuel de l'Histoire de la Littérature Française*(1898; Eng. trans.); *Discours Académiques* (1901); *Nouveaux Essais sur la Littérature Contemporaine* (1904); *Histoire de la Littérature Française Classique* (begun in 1905); *Sur les Chemins de la Croyance* (1905). (Consult J. Lemaître's appreciation in *Mes Contemporains*; Babbitt's *Masters of Modern Criticism* (1912).

Brunhilda, brŏŏn-hil′dä, in the *Nibelungenlied,* queen of Iceland, wife of Gunther, who procured the murder by Hagen of Kriemhild's husband Siegfried (see Nibelungenlied). She is identified with one of the Valkyrie, in Norse mythology, whom Odin deprived of her divinity, and threw into a deep sleep, from which Sigurd awakened her.

Brunhilda, a Visigoth princess, was married (567) to Sigbert, king of Austrasia, and became (596) regent for her two grandsons in the rule of half the Frankish kingdom; Fredegond ruling the other half for Clotaire ii. On Fredegond's death (598) she became sole Merovingian queen, but was deposed and put to death in 613.

Bruni, brōō-nī′, island, Tasmania, in Storm Bay, and 20 miles south of Hobart Town; there is a lighthouse on the south end. Area, 160 square miles.

Bruni, Leonardo (1369–1444), Italian humanist and historian, was born in Arezzo. He devoted his youth to the study of the classics, and was papal secretary under four popes (1405–15). He then retired to Florence, of which city he became historian, and chancellor (1427). His *Historiarum Florentinarum Libri XII.* is a monument of research; while his *Commentarius Rerum suo Tempore Gestarum* and *Epistolæ Familiares* are full of interest for the history of the time. Though small in compass, the best known of Bruni's writings is the *Life* of Dante.

Brünig Pass, brü′ni*ch* (3,396 ft.), leads from the Swiss canton of Unterwalden and Lucerne to that of Berne, reached at Meiringen in the Hasli or Upper Aar Valley. It is extremely easy, and is traversed by a mountain railway.

Brünn, brün, town and episcopal see, capital of Moravia; 70 miles northeast of Vienna. It is at the foot of the Spielberg, an isolated hill rising 185 feet above the town, and crowned by the Citadel or Castle, which from 1621 to 1855 served as an imperial state prison, where, among other political offenders, Baron von der Trenck (1746–9) and the Italian poet Silvio Pellico (1822–30) were incarcerated. Among the churches the most noteworthy are the Cathedral (fifteenth century) and the Gothic Church of St. James. There are also the handsome Meeting House (1876–81) of the Moravian Estates, National Industrial Art School, Technical High School, Picture Gallery, and the Blind Institute for Moravia and Silesia.

Brünn is a busy industrial town. Woolen factories are the most important; and the manufacture of machinery, leather, gloves, hats, chemicals, sugar, starch, spirits, brewing, dyeing, flour milling, and brick making are conducted on a large scale. The town was besieged, but in vain, by the Hussites in 1428; by the Bohemian King George Podiebrad in 1467; by the Swedes in 1645; by the Prussians in 1742; and by the French in 1805; the last named forced it to capitulate four years later. Pop. (1900) 108,944; (1911) 125,008—about one-half of Czech race, the rest mostly of Teutonic descent.

Brunne, brun, Robert of. See Mannyng, Robert.

Brunnen, brŏŏn′en, summer resort, Switzerland, on the Lake of Lucerne; 20 miles southeast of Lucerne.

Brunner, brŏŏn′er, Arnold William (1857), American architect, was born in New York City, and was educated at the College of the City of New York and the Massachusetts Institute of Technology. He designed Mount Sinai Hospital, Columbia School of Mines, City College Stadium, and Students' Hall, Barnard College, New York City; U. S. Post Office, Custom House, and Court House, Cleveland, O.; the new State Department Building, Washington, D. C. He was president of the Architectural League (1903–04), and a member of the New York Art Commission (1908–10). He is a member of the National Academy of Design and the National Institute of Arts and Letters. Author of *Interior Decoration* (1891).

Brunner, Heinrich (1840), German lawyer, was born in Wels, Upper Austria. In 1873 he became professor of the history of laws at the University of Berlin. His two principal works are *Die Entstehung der Schwurgerichte* (1872) and *Deutsche Rechtsgeschichte* (2 vols., 1887–92). His works on the history of German, Frank, Norman, and Anglo-Norman jurisprudence are also of great value.

Bruno, brōō′nō, Giordano (?1550–1600), Italian philosopher, was born at Nola, in the kingdom of Naples. In his youth he was a Dominican monk, but fled (1576) to Switzerland on account of his heretical opinions. After spending two years (1577–9) in Geneva, he proceeded to Toulouse, and finally (1581) to Paris, where, in 1582, he published a satrical comedy, *Il Candelajo,* in which he ridiculed several classes and professions. He next gave lectures on philosophy, and strongly attacked the Aristotelians. Thereafter he visited England (1583), where he contracted a friendship with Sir Philip Sidney, to whom he dedicated his next two works, the *Spaccio della Bestia Trionfante* ('Expulsion of the Triumphant Beast'), an attack upon Rome; and the *Cena delle Ceneri* ('Evening Conversations on Ash Wednesday'), defending the Copernican system of astronomy.

Bruno's *Della Causa Principio ed Uno* (1584) and his *Del Infinito Universo e Mondi* (1584) are his chief metaphysical works, and in these he develops a pantheistic system. He held that the infinite soul of God did not merely inhabit or pervade the universe, but that the universe was simply a manifestation of Him, and therefore itself divine. God was therefore, in the most literal and physical sense, all *in* all. Bruno's philosophy seems to have influenced Spinoza, Descartes, Schelling, and other thinkers. In 1586 he obtained a professorship at Wittenberg, where he published in 1587 his treatise *De Lampade Combinatoria Lulliana.* In 1592 he returned to Italy, but was at length arrested (1593) and imprisoned by the Inquisition. Refusing to recant his heresies, he was condemned to death, and was burned at the stake on Feb. 17, 1600. On the scene of his martyrdom, the *Campo dei Fiori,* a monument to his memory was unveiled in 1889. Consult works on Bruno by Bartholmèss, Berti, Sigwart, Brunnhofer, Miss Frith, and L. M'Intyre; also J. A. Symonds' exposition of his teachings.

Bruno, St. (*c.* 1040–1101), was born at Cologne, and became a canon of Rheims, and a director of the schools of the diocese. With six companions he retired to the desert near Grenoble, and founded there the Carthusian order (1084). (See Carthusians.) Pope Urban ii. summoned him to Rome; but after a few years of the papal court he retired (1094) into Calabria, where he founded a second Carthusian monastery at Della Torre. He was canonized in 1628. His day is Oct. 6.

Bruno the Great (925–965), archbishop of Cologne (953) and duke of Lorraine (954), was the son of Henry the Fowler and brother of Otho i. A celebrated scholar and statesman, he reconciled his brother and the French court, and is credited with the authorship of a commentary on the Pentateuch, and of a work on the lives of the saints.

Brunsbüttel, brōōns′bōōt-*el*, fortified seaport town, Holstein, Prussia, at the mouth of the River Elbe; 15 miles east of Cuxhaven. The Kaiser Wilhelm Canal (q. v.) terminates in two locks at this place. Pop. 3,000.

Brunswick, brunz′wik (German *Braunschweig*), a sovereign duchy of the former German Empire, embracing five small enclaves and three larger divisions, surrounded by the provinces of Hanover, Saxony, and Westphalia. The northern division is fertile, and consists partly of undulating hills, offshoots of the Harz Mountains. It partly merges into the Lüneburg Heath. The two southern divisions belong to the Harz and Weser Mountains, while the River Weser crosses the western division. The leading industries are agriculture (especially cattle grazing and fruit growing), mining (lignite, iron, asphalt) in the Harz, and some manufacturing (chiefly sugar, sulphuric acid, beer, and spirits). The duchy includes extensive forests. Area, 1,424 square miles. Pop. (1910) 494,387, the majority being Lutherans.

Originally Brunswick formed part of the duchy of Saxony, but in 1235 the independent duchy of Brunswick was created. Subsequently, along with Hanover, Lüneburg, Celle, and other territories, it was transferred and reconveyed several times as the various Brunswick dynasties were founded and died out. The direct Welf (Guelf) line became extinct in 1884, and after 1885 the duchy was governed by a regent.

Brunswick, town, capital of Brunswick, Germany; 32 miles by rail southeast of Hanover. The central portions consist of the old town, built in typical German architectural style, surrounded by a chain of parks. Among the noteworthy public buildings are the Cathedral (1172), containing the tomb of Henry the Lion, duke of Saxony, and the Ducal Palace, with fine collections of pictures, majolica, and gems, among the finest in Germany. Spohr, the musician (1784), and the mathematician Gauss (1777) were born here, and Lessing died in the town (1781). The principal manufactures are jute spinning, printing, the manufacture of sewing machines, sugar, gold and silver wares. Pop. (1910) 143,534.

The town owed much of its importance to the fact that it stood at the intersection of the trade routes from the Rhine to the Elbe and from Hamburg to Leipzig, and to its alliance with the Hanseatic towns (1274).

Brunswick, city, Georgia, county seat of Glynn county, on St. Simon's Sound, and the Southern, the Atlantic Coast Line, and the Atlanta, Birmingham, and Atlantic Railroads; 70 miles southwest of Savannah. It is connected by steamer with points north and south, and is a popular health resort. Features are the Shell Boulevards, St. Simon's Island and lighthouse, and Cumberland Island. According to the U. S. Census for 1914, there were 34 industrial establishments, with $831,000 capital, and products valued at $841,000. Industries include truck gardening, fishing, lumber mills, foundries, and machine shops, vegetable and oyster canneries, and box, carriage, and cigar factories. The town was founded by James Oglethorpe in 1735. Pop. (1900) 9,081; (1910) 10,182.

Brunswick, town, Cumberland county, Maine, on the Androscoggin River, and the Maine Central Railroad; 9 miles west of Bath. It is the seat of Bowdoin College (q. v.). The river here affords excellent water power, which is utilized in large paper, pulp, and cotton mills. Other manufactures are flour, general hardware, canned goods, boxes, and wooden articles. A bridge connects the town with Topsham, across the river. Brunswick was settled in 1628 under the name of Pejepscot. Pop. (1900) 6,806; (1910) 6,621.

Brunswick, FRIEDRICH WILHELM, DUKE OF (1771–1815), fourth son of Duke Ferdinand, served in the Prussian army in the war against France (1792), and on the death of his father, in 1806, continued his opposition to Napoleon, who abolished the duchy at the Peace of Tilsit (1808). In 1809 he cut his way through Germany, shipped to Heligoland, reached England, and served under Wellington in the Peninsula. Reinstated in his duchy by the allies in 1813, he afterward took part in the campaign of 1814–15, and was killed at Quatre Bras.

Brunswick Black, a varnish composed of asphalt or pitch, linseed oil, and turpentine; used to give a glossy appearance to metal and other articles. *Berlin black* is a finer variety of the varnish.

Brunswick Green. See PIGMENTS.

Brusa, brōō′sä, BRUSSA, or BROUSSA, town, Asiatic Turkey, at the base of Mount Olympus or Keshish Dagh; 60 miles southeast of Constantinople. It has important silk manufactures, and produces fruit and wine. It is the seat of an archbishop of the Greek and of the Armenian Church. Near it are iron and sulphur springs, known formerly as Pithya. It is connected by rail (26 miles) with its port. Mudania. Under the name of *Prusa* it was the capital of ancient Bithynia. Pop. 110,000.

Brush, CHARLES FRANCIS (1849), American inventor, was born in Euclid, O., and was graduated from the University of Michigan (1869). He is the inventor of the Brush dynamo-electric machine (1876), the 'series' electric arc lamp (1878), and many electrical devices, chiefly for improving those two inventions. He is the founder of the Brush Electric Company, Cleveland, O. In 1881 he was decorated by the French government, and in 1899 was awarded the Rumford medal of the British Royal Society.

Brush, GEORGE DE FOREST (1855), American painter, was born in Shelbyville, Tenn., and studied at the École des Beaux Arts, Paris. His early paintings depicted Indian life, but he subsequently devoted himself to figure painting and portrait groups in the style of the Dutch and Flemish schools. He received gold medals at the Chicago, Paris, Buffalo, and St. Louis Expositions. He is a member of the National Academy of Design and the National Institute of Arts and Letters. Among his works are: *The Moose Chase; The Indian and the Lily; The Silence Broken; The Artist; Mother and Child;* and numerous *Family Groups.*

Brushes. In the making of brushes, a great variety of materials are employed. For coarse work, twigs of broom, birch, heather, and rushes are generally used, as well as rope, yarn, and the fibre of cane, cocoanut, and many other plants. Scratch brushes for cleaning metal surfaces are made of wire; brushes for working in acids, of spun glass. Small brushes are known as pencils, and for these the carefully chosen hair of certain animals is utilized. For artists' pencils sable is the best and dearest, but the hair from the camel, the ichneumon, and the cow's ear is much used. Varnishing brushes are made from bears' fur; while badgers' hair, being long and elastic, is used for graining and gilding. By far the greatest number of brushes are made from pigs' bristles. (See BRISTLES.)

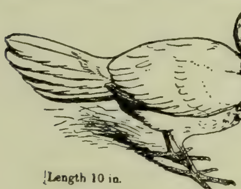
Brushes may be divided into *simple* and *compound*—the former consisting of one tuft, the latter of many. Simple flat or round brushes are made by fastening a bundle of arranged bristles into the specially shaped socket. In the manufacture of artists' brushes, the hairs, after cleaning, are arranged in bunches, the point being formed very carefully. The bunch is then tied and inserted in a quill which has previously been expanded by heating in hot water. On drying it contracts, holding the bunch securely. Metal caps are also used in place of quills. Other brushes are made of broom corn and of feathers.

Compound brushes may be 'set' or 'drawn.' In the former, the tuft is fastened directly into the hole bored in the stock or head; in the latter, the bristles are bent double across a wire, which is then used as a loop to draw the tuft into position. Compound brushes are made chiefly by the Woodbury machine. Many materials other than wood—such as celluloid, ebonite, and metal—are used for stocks and handles. Bottle-brushes are made by fastening the bristles between two wires and allowing them to project on both sides. The wires are then twisted firmly together.

According to the U. S. Census of 1910, there were in the preceding year 1,282 establishments in the country producing brooms and brushes, with 12,153 wage earners, a capital of $18,982,000, and products valued at $29,126,000 (an increase of 38 per cent. since 1904).

In electro-technics, brushes are strips of copper or carbon rods which convey the current from the terminals of an electric motor to the commutator; or in the case of a dynamo, in the reverse direction. (See Dynamo and Motor.)

Brush Turkey, the popular name of *Catheturus lathami*, the largest of the megapodes. These birds are natives of Australia and the Pacific Islands, about the size of the common turkey, blackish brown in color, and construct mounds of loose soil, twigs, and leaves in which the eggs are laid. See Mound Birds.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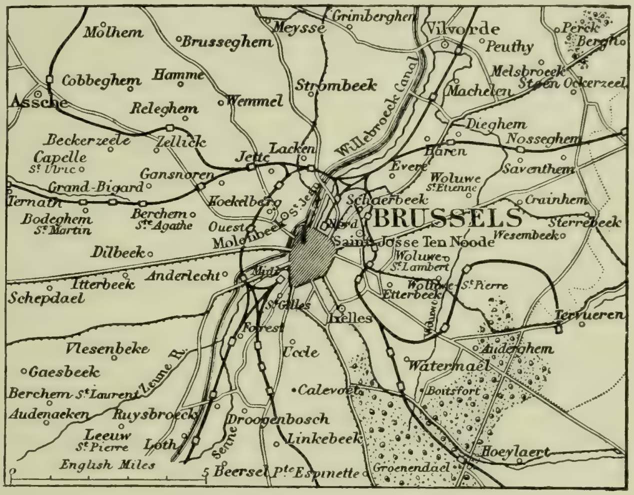
Brush Turkey.

Brussa. See Brusa.

Brussels (French Bruxelles), the capital of Belgium, Brabant province, stands near the middle of the country, on the Senne River, and on the Willebroeck and Charleroi Canals; 27 miles by rail south of Antwerp, and 193 miles northeast of Paris. The modern city is handsome, and has a ring of fourteen large industrial suburbs (Schaerbeek, St. Josse ten Noode, Ixelles, St. Gilles, Molenbeek St. Jean, Laeken, Anderlecht, Koekelberg, Jette Saint Pierre, Forest, Uccle, Watermael Boitsfort, Woluwe Saint Lambert, and Itterbeek), separated from it by wide boulevards, which also intersect the city. There is an extensive system of electric and steam tramways.

The city is divided by the river into the Lower Town—the old section—to the northwest, and the Upper Town—the new quarter—on the slope to the southeast. The Upper Town contains the Royal Palace, the embassies, hotels, and fine residences; while the Lower Town is devoted chiefly to industry and commerce.

The Cathedral of St. Gudule (1220–1539), overlooking the Lower Town, is renowned for its statues, painted glass, and carved pulpit. In the Park (Upper Town) are the ministries of state and Belgian Houses of Parliament, at the northern end; and at the southern end, the Royal Palace and the palace presented to William II. in 1829 by the nation, and now used by the Academies of Science, Letters, Fine Arts, and Medicine. The Palace of Fine Arts and the Museum of Modern Paintings are both extremely rich in works by the great Flemish masters. East and southeast of the Park are the handsome and aristocratic quarters of Léopold and Northeast and the Avenue Louise. Still farther east are the Royal Museum of the Industrial and Decorative Arts (Palace of the Cinquantenaire), the Museum of Education, the Museum of Natural History, the unique Wiertz Museum, and the Museum of Forestry (opened in 1902).



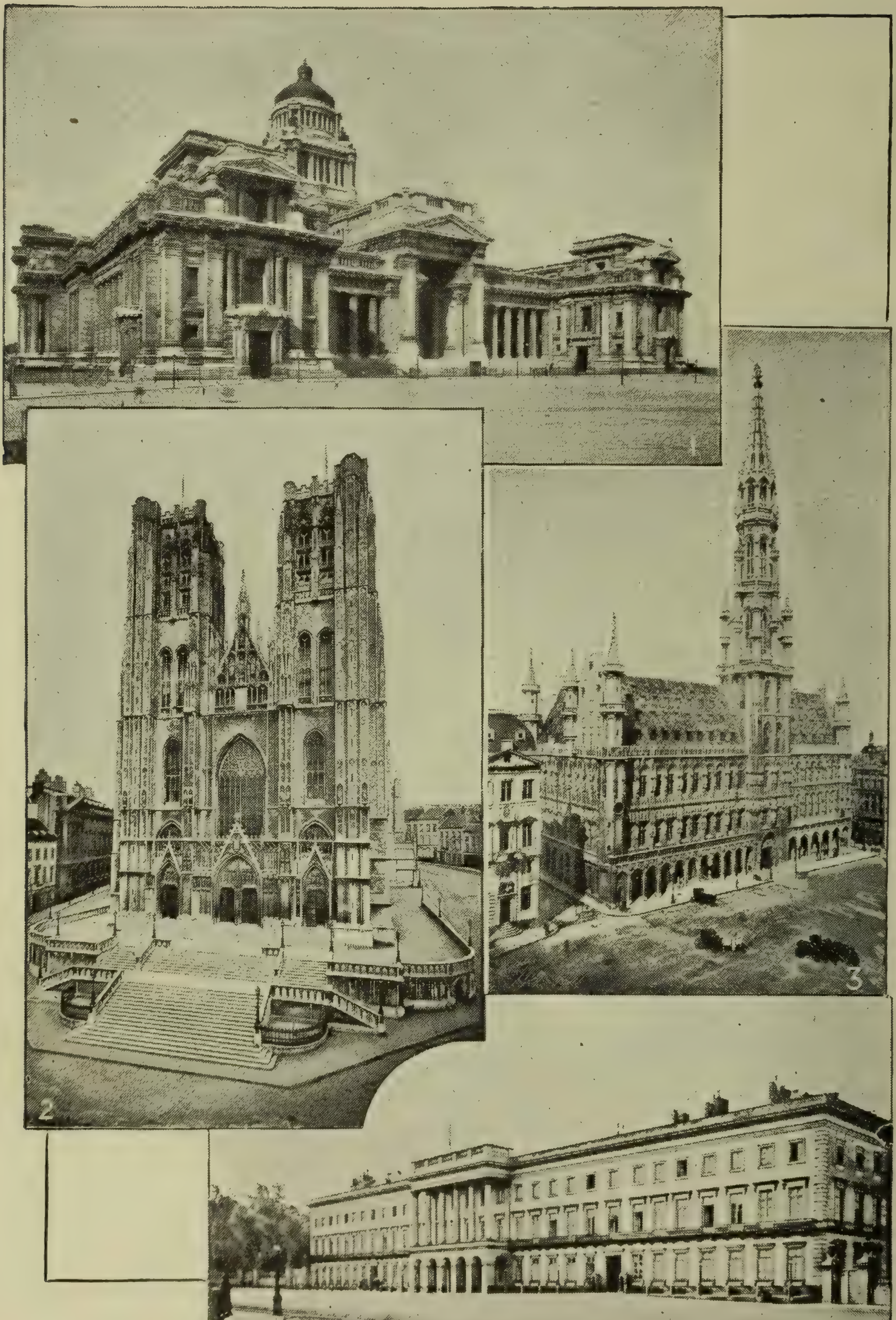
Brussels and Environs.

The Conservatoire Royal de Musique (1876–7) contains a collection of rare musical instruments. The Picture Gallery is comparable in the richness of its collection to that of Antwerp. The massive Palais de Justice (1866–83), costing $10,000,000, ranks first among the modern buildings. Important monuments are Poelaert's Doric column (147 feet high) in the Place du Congrès, commemorating the Congress of 1831, and the elaborate monument to Egmont and Hoorn (1864).

In the Lower Town, approached by the steep Montagne de la Cour, an important shopping centre, is the picturesque old market place, with its guild houses, the sixteenth-century Maison du Roi (Brood Huis), now used by the municipal officials, and the Hôtel de Ville (fifteenth century).

Brussels with its suburbs is the seat of important industries, especially the manufacture of lace, furniture, bronzes, woollen, fine cottons, carriages, automobiles, bicycles, leather goods, beer, bricks, shoes, and cigarettes. There is connection by canal with the Scheldt, with Ostend, and with the Sambre; and an extensive port, under construction since 1900, is expected to be opened to seagoing vessels in 1914. Improvements on the Willebroeck and Charleroi Canals will be completed about the same time. In 1911–12, 11,223 vessels of 16,299,746 tons entered the port, and 11,243 vessels of 16,340,009 tons cleared.

Brussels is governed by a burgomaster, assisted by an



VIEWS IN BRUSSELS.

1. Palais de Justice. 2. Cathedral of St. Gudule. 3. Hôtel de Ville. 4. Royal Palace.

elective council. The city maintains 12 hospitals. The University of Brussels (q. v.), the Royal Academy of Fine Arts, the Royal Library, and the numerous museums are the most important educational institutions.

Population.—The population of Greater Brussels is 775,039 (1921). In 1911 it was 728,910; in 1900 it was 547,362.

History.—Brussels is said to have been founded in the sixth century. In the eleventh century it was chosen by the Duke of Lower Burgundy as his capital, and in 1477 it became the capital of the Austrian Netherlands. The town was foremost in the revolt of the Netherlands against Spain (1566–85). In 1695 it suffered a bombardment by Marshal Villeroi. From 1697 to 1794 it was again under Austrian dominion. Between 1815 and 1830 it was, alternately with The Hague, capital of the Netherlands, and in 1830 it became the capital of the new kingdom of Belgium.

Early in the Great War, on Aug. 20, 1914, the city was occupied by the Germans in their invasion of Belgium, the government having been transferred to Antwerp three days previously (see EUROPE, GREAT WAR OF). The city was reoccupied by the Belgian army on Nov. 18, 1918, and the sovereigns returned in state on Nov. 22.

Several international conferences have been held in Brussels. Here in 1874, at the call of the Emperor of Russia, there convened an important international conference on the laws and usages of war, generally known as the Brussels Conference. The United States took no part, but all the leading European states were represented. Its purpose was to ameliorate the conditions of civilized warfare, and it reached unanimity on the questions of combatants, non-combatants, spies, sieges and bombardments, prisoners of war, capitulations, armistices, flags of truce, and the legitimate means of injuring an enemy. Great Britain, however, refused to agree to any interference with the rules of naval warfare, and stood out for the rights of small states when invaded by demanding that conquest should be effective before it could be recognized, and by maintaining the right of a people to rise *en masse* in opposition to an invading army. (See BELLIGERENT.)

In 1876, Leopold, king of the Belgians, summoned to a conference at Brussels unofficial representatives of the Great Powers, in order to decide upon the best methods for the exploration and opening up of Africa to European trade and civilization. It resulted eventually in the creation of the Congo Free State. In 1899–1900 another conference, for the suppression of the slave trade in Africa, took place here, and in 1892 Brussels was the meeting place of the International Monetary Conference. In 1910 the Brussels Exposition (q. v.) was held. Consult Gilliat-Smith's *Story of Brussels* (new ed. 1912).

Brussels Carpet. See CARPETS.

Brussels Conference. See BRUSSELS, *History.*

Brussels Exposition, an international exposition held in Brussels, Belgium, from April 23 to Nov. 7, 1910. The grounds in the Avenue Louise covered an area of 225 acres, and the buildings had a total floor space of 2,278,650 square feet. The three principal buildings were the Industrial, Machinery, and Railway Halls. Twenty-four foreign countries participated, the Belgian, French, German, British, and Italian exhibits being the most extensive. The Exposition was visited by nearly 13,000,000 persons, the largest attendance in any one day being 200,000. The total admission receipts were $1,119,400.

On Aug. 14 the Belgian, British, and part of the French sections in the Industrial Hall were destroyed by fire. The loss was placed at $10,000,000.

Brussels Lace, a lace of Brussels and its vicinity, famous since the seventeenth century. It was made in separate pieces, which were then woven together. The needlepoint (*point d'Aiguille*) was the most beautiful and expensive kind; the *point d'Angleterre* was made on pillows with bobbins.

Modern Brussels is manufactured by applying needles or bobbin-made flowers to a net ground, usually machine made; while the thread used is largely cotton, instead of linen, as formerly See LACE.

Brussels Sprouts, a cultivated form of *Brassica oleracea,* is distinguished from the cabbage in the growth of small heads (each of them a miniature cabbage) in the axils of the leaves for the whole length of the stem, the leaves being cut away as the buds develop. Its cultivation is similar to that of the cabbage (q. v.), a deep rich soil being necessary to bring it to perfection. It is hardier than cabbage, and makes its best growth in the fall. The seed should be sown about June, and transplanted to the field the last of July or first of August—about 20 inches apart in rows 2 feet apart.

Brussels Sugar Convention. In 1898 representatives of the powers met at Brussels to discuss measures for the abolition of bounties on sugar (see BOUNTY), but no plan was then agreed upon. In 1902 another conference was held, and a convention, to take effect Sept. 1, 1903, was concluded. By the terms of this Convention all export bounties, direct and indirect, were abolished, and the excess of import duties over excise duties was limited to 53 cents per 100 pounds. The Convention was ratified by Germany, Austria-Hungary, France, Belgium, the Netherlands, Sweden, Italy, Spain, and the United Kingdom. Russia, Luxemburg, and Peru were subsequently admitted to the Convention.

The Convention was originally in force for five years from Sept. 1, 1903. It was renewed in 1907 and in 1912; but in the latter year Great Britain gave notice of her withdrawal because of opposition to the limitation by the convention of Russian export of sugar. The outbreak of the Great War rendered the Convention ineffective.

Brussels, University of, an institution of learning in Brussels, Belgium, founded in 1834. It consists of the faculties of philosophy and letters, science, law, and medicine, the Polytechnic School, the Schools of Political and Social Science, of Applied Sciences, and of Commerce, and an Extension Department giving instruction in many places. In 1922–3 the University had 2,110 students, and a library of over 80,000 volumes. It publishes *La Revue de l'Université de Bruxelles.*

Brussiloff, brus'i-lov, BRUSSILOV, or BRUSILOFF, ALEXEI ALEXEIVITCH (1856–), Russian general, was born in Kutais, Russian Caucasus, of a family which for many years stood high in the imperial service. Educated in the Russian military schools, he entered the Tver Dragoons stationed in the Caucasus. After the Russo-Turkish War (1877–8) he was made adjutant to Colonel Sukhomlinoff, head of the Officers' Cavalry School at Petrograd, and later entered the Imperial Guards, rising successively to the command of a regiment, a brigade, a division, and the Fourteenth Army Corps stationed at Lublin. From Lublin he was transferred to Warsaw (1912), where he was promoted to the rank of full general, and from Warsaw to Vinnitsa (1913), headquarters of the Twelfth Army Corps.

Died
Mar. 17, 1926

In the first months of the European War, General Brussiloff cooperated with General Russky in driving back the Austrian forces under General von Auffenberg; and later at Lupkoff Pass in the Carpathians he defeated an Austrian force which was seeking to relieve Przemysl. In April, 1916, he succeeded General Ivanoff in command of the forces from the Pripet Marshes to the Roumanian frontier, and in June opened the brilliant offensive which resulted in the occupation of Bukowina and much of Southern Galicia. In June, 1917, he was appointed to succeed General Alexieff as commander-in-chief of all the Russian armies. He resigned from this position early in the following August, and was succeeded by General Korniloff. He later accepted the Bolshevik rule, and coöperated with the soviet government to the extent of serving on its military committees.

Brut, brōōt, a chronicle in 32,000 verses, written by Layamon (q. v.), recording the wanderings of Brut or Brutus, one of the heroes of Troy.

Bruta. See Edentata.

Brütt, brüt, Ferdinand (1849–), German historical and genre painter, was born in Hamburg, and studied at the art institute in Weimar. His early canvases deal with peasant life—*e.g., A Peasant Deputation, The Hope of the Country, Rest Disturbed.* After 1880 he made a specialty of town life, and painted *Convicted* (Hamburg Museum), *Acquitted, A Difficult Choice, On the Stock Exchange, The Peasant in Court* (Berlin Museum), *In the Theatre Lobby,* and *The Installation of the Young Minister.* He has also painted portraits and religious pictures—*Christ Victorious* and *The Christ Night.*

Brut'tium, ancient name of the southern extremity or 'toe' of Italy. The sea coast was occupied by Greek colonies; the interior was held by the *Bruttii,* who were subdued by Rome in 272 B.C. In the Second Punic War they helped Hannibal, and after its conclusion their territory was confiscated, and they were declared public slaves. See Calabria.

Brutus, a Roman family of the Junian clan, of which the most famous members were:

(1) Lucius Junius Brutus, son of M. Junius and Tarquinia, sister of Tarquinius Superbus. When Tarquinius murdered his possible rivals, in order to make sure his own position as king, Lucius saved himself by pretending to be an idiot; hence his name Brutus, 'the imbecile.' After the outrage on Lucretia (q. v.), Brutus vowed vengeance on the Tarquins, and roused the people to expel the King and his family. He became the first consul of Rome in 509 B.C., and executed his two sons, who were found guilty of a conspiracy to restore the Tarquins. He fell the same year, fighting against Aruns, son of Tarquinius.

(2) Marcus Junius Brutus (85–42 B.C.), was a nephew of Cato, by whom he was imbued with a love of learning, which he retained throughout life. On the outbreak of the civil war in 49 he joined Pompey, and fought with distinction near Dyrrachium. After Pharsalia (q. v.), in 48, he asked and obtained pardon from Cæsar, who in 46 made him governor of Cisalpine Gaul. In 44 he was prætor, and Cassius prevailed on him to join the conspirators who murdered Cæsar on March 15. In 42 he and Cassius fought Antony and Augustus at Philippi (q. v.): in a first engagement, Brutus defeated Augustus, while Cassius lost to Antony; in a second, Brutus was completely defeated, and killed himself. Consult Plutarch's *Lives* and Cicero's *Letters.*

(3) Decimus Junius Brutus Albinus, another of the murderers of Cæsar, the hero of 'Et tu, Brute!' In 49 he commanded Cæsar's fleet which took Massilia, where he remained true to Cæsar, in spite of Mark Antony's attempts to draw him into a plot against Cæsar's life. After Cæsar's death he went to his province, Cisalpine Gaul; but the coalition of Antony, Lepidus, and Augustus induced him to attempt to join Marcus Brutus in Macedonia. On his way he was betrayed by a Gaulish chieftain to Antony, who had him put to death.

Brüx, brüks (Czech. *Most*), town, Czechoslovakia, at the southern foot of the Erzgebirge; 45 miles northwest of Prague. It is the centre of rich coal fields, and has iron foundries and manufactures of sugar, agricultural machinery, and spirits. Pop. (1921), 27,239.

Bruxelles. See Brussels.

Bruyère, La. See La Bruyère.

Bry, Jean Théodore de (1561–1623), son of Théodore Bry (q.v.), was born in Strassburg. As an artistic engraver he was better known than his father. He executed, in the form of a frieze, *The Triumph of Bacchus, The Triumph of Jesus Christ, The Marriage of Isaac and Rebekah.*

Bry, brē, or Brie, Théodore de (1528–98), Belgian goldsmith, engraver, and painter, was born in Liège. When a young man he lived for a time in London. With his sons, Jean Théodore (q.v.), and Jean Isräel (*d.* 1611), he published several illustrated books of travel, the best known being *Collectiones Peregrinationum in Indiam Orientalem et Occidentalem* (6 vols. 1590–9). This monumental work was continued by his sons, being published in 19 vols. (1599–1634) with Latin text, but containing some parts in English, French, and German.

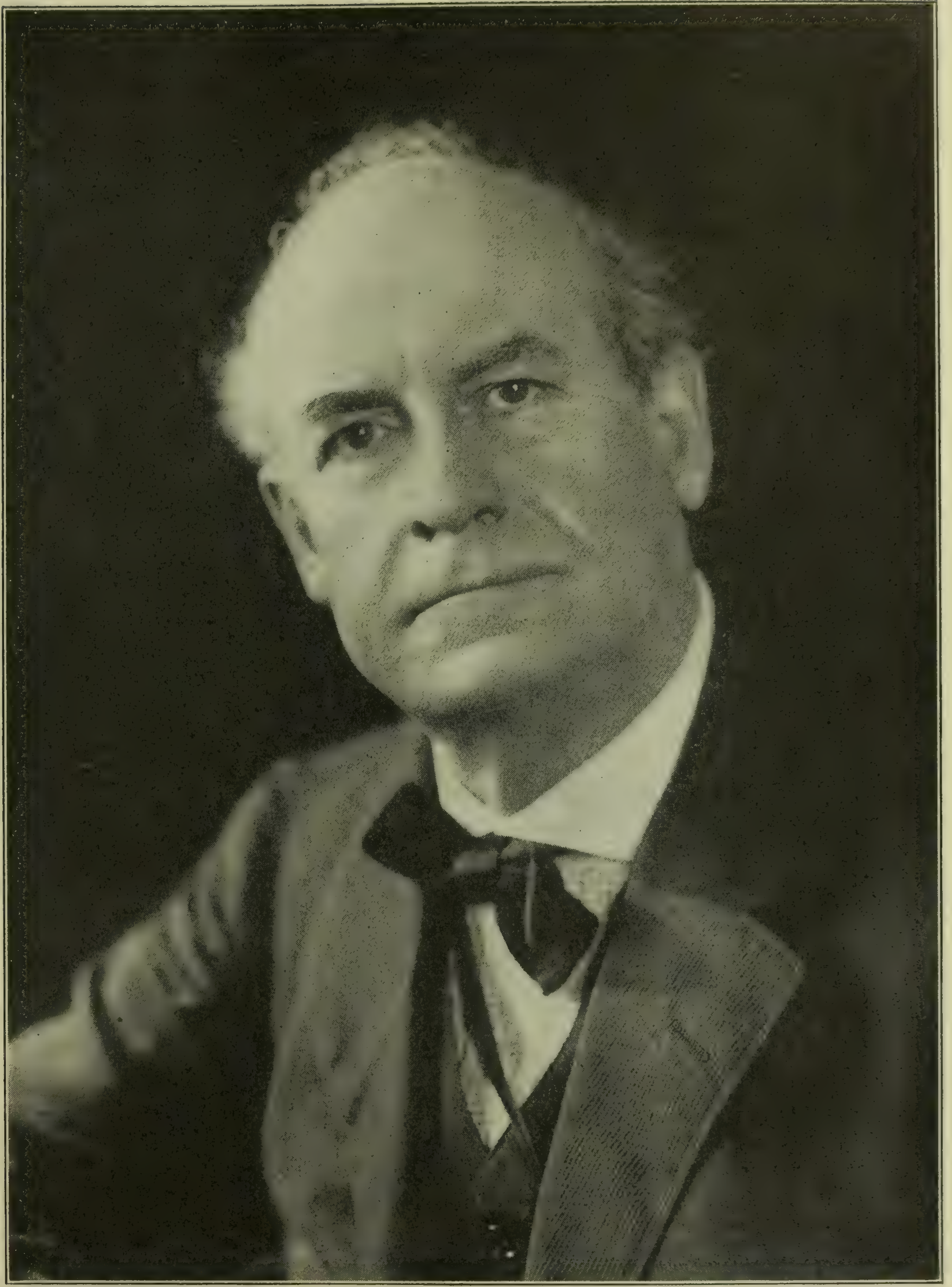
Bry'an, village, Ohio, county seat of Williams county, on the Cincinnati Northern and the New York Central Railroads; 55 miles southwest of Toledo. It has manufactures of condensed milk, picture frames, automobile parts, electric washers, wheelbarrows, furniture, toys, candy, and wooden ware. Pop. (1910), 3,641; (1920) 4,252.

Bryan, city, Texas, county seat of Brazos county, on the Southern Pacific and the International-Great Northern Railroads; 100 miles northwest of Houston. The State Agricultural and Mechanical College is situated nearby. Cotton, cottonseed oil, carriages, and fertilizers are manufactured. Pop. (1910) 4,132; (1920) 6,307.

Bryan, Charles Page (1856–1918), American diplomat, was born in Chicago, Ill., and educated in the University of Virginia and the Columbian Law School, Washington, D. C., in which city he was admitted to the bar in 1878. He practised in Colorado in 1879–84, and served for two terms in the State legislature. In 1891–2 he visited Europe in the interest of the Columbian Exposition. He was a member of the Illinois assembly (1888–97) and colonel on the governor's staff (1887–96). He served as minister plenipotentiary to China (1897–8), Brazil (1898–1902), Switzerland (1902–03), Portugal (1903–10), Belgium (1910–11), and as ambassador to Japan (Aug., 1911–Nov., 1912). In 1913 he was decorated by the Emperor of Japan with the Grand Cordon of the Order of the Rising Sun.

Bryan, Charles Wayland (1867–), American editor and public official, was born in Salem, Ill. He was for a time a travelling salesman, later became private secretary to his brother, William J. Bryan (q. v.), and in 1896 established with him the journal known as *The Commoner.* He was mayor of Lincoln, Nebraska, 1915–16, and a member at various times of the City Council. In 1922 he was elected governor of Nebraska. At the Democratic National Convention in New York City, July, 1924, he was nominated for Vice-President by acclamation on the first ballot. Mr. Bryan owns and operates two farms near Lincoln, and is particularly friendly to the agricultural interests of the country.

Bryan, Elmer Burritt (1865–), American educator, was born in Van Wert, O. He was graduated from Indiana University (1893), and studied at Harvard and Clark Universities. From 1897 to 1901 he was assistant and associate professor of pedagogy at Indiana University. In 1901–02 he served as principal of the In-



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WILLIAM JENNINGS BRYAN

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sular Normal School, Philippine Islands, and in 1903 as superintendent of education for the Philippines. He was professor of psychology, Indiana University, in 1903–05, and president of Franklin College in 1905–09. In 1909 he became president of Colgate University. His published works include: *The Basis of Practical Teaching* (1905); *The Longer Life; Fundamental Facts for the Teacher* (1911).

Bry'an, NATHAN PHILEMON (1872–), American legislator, was born in Orange (now Lake) county, Florida. He was graduated from Emory College in 1893, and in 1895 was admitted to the Florida bar. In 1905–09 he was chairman of the Board of Control of the Florida State Institutions of Higher Education. He was U. S. Senator (Dem.) in 1911–17, and after 1920 a judge in the U. S. Circuit Court of Appeals.

Bryan, WILLIAM JENNINGS (1860–1925), American public official, orator, and editor, was born in Salem, Ill. He was graduated from Illinois College, Jacksonville (1881), and from the Union College of Law, Chicago (1883), practised law at Jacksonville (1883–87), and in 1887 removed to Lincoln, Neb. In 1891–95 he was a member of Congress, and in 1894–96 editor of the Omaha *World-Herald.*

In 1896 Bryan was a delegate to the National Democratic Convention at Chicago, in which he was a leader of the free-silver forces, and wrote the silver plank of the platform. His brilliant, impassioned speech, on this occasion, in which occurred the famous passage, 'You shall not press down upon the brow of labor this crown of thorns; you shall not crucify mankind upon a cross of gold,' contributed, it is generally believed, to his own unexpected nomination. He was subsequently nominated by the People's and National Silver Parties, also, and conducted a notable campaign. In the ensuing election he was defeated by William McKinley, who received 271 of the 447 electoral votes and 7,104,779 of the 13,607,704 popular votes. In 1900 Bryan was again the Presidential candidate of the Democratic and Populist Parties, and of the Silver Republicans, on an anti-imperialism and free-silver platform, and was again defeated by McKinley.

During the Spanish-American War (1898) Bryan raised the Third Nebraska Volunteer Infantry Regiment, and was commissioned its colonel. In 1901 he established at Lincoln the weekly political journal, *The Commoner* (changed to a monthly in 1913), which he subsequently edited.

For the third time, in 1908, Bryan was the Democratic candidate for President, on a platform which called for a lower tariff and the prevention of private monopoly. He was defeated by William H. Taft, who received 321 electoral votes out of 487, and a plurality of 1,271,837.

In 1912 Bryan was a delegate to the Democratic National Convention at Baltimore, where he was influential in securing the nomination of Woodrow Wilson for President. In March, 1913, he was appointed Secretary of State. In this office he aided in bringing about the recognition of the Chinese Republic by the United States and negotiated arbitration treaties with many governments. On June 8, 1915, he resigned his office because of President Wilson's policy toward Germany in the Great War of Europe (q. v.), which he believed to be detrimental to the promotion of international peace.

As a delegate-at-large to the Democratic National Convention of 1920, Bryan sought for the adoption of a 'dry' plank in the party platform but without success. Having removed to Miami, Fla., he was a delegate from that State to the Democratic Convention of 1924.

William Jennings Bryan played a prominent part in the movement for international peace, and his famous 'peace plan' led to the conclusion of arbitration treaties with more than thirty countries (see ARBITRATION, INTERNATIONAL). He was also an ardent temperance advocate and after his appointment as Secretary of State created much comment and not a little ridicule by serving grape juice instead of alcoholic beverages at diplomatic dinners. His appearance on the Chautauqua lecture circuit while a member of the Cabinet was also sharply criticised.

In his later years Bryan attracted much attention by his attacks upon the Darwinian theory of evolution, which he held was irrevocably opposed to the teaching of the Bible. He lectured widely on the subject, and published *The Menace of Darwinism* and *The Bible and Its Enemies* (1921) and *In His Image* (1922). Shortly before his death he volunteered his services to the State of Tennessee, in its prosecution of John T. Scopes on a charge of violating the law prohibiting the teaching of evolution in the schools of that State. He died suddenly of heart disease at Dayton, Tenn., July 26, 1925, a few days after the conviction of Scopes. He was buried in the Arlington National Cemetery.

Bryan's published works include: *The First Battle* (1897); *The Commoner Condensed* (1902); *Letters to a Chinese Official* (1906); *The Old World and Its Ways* (1907); *Speeches* (1911); *A Tale of Two Conventions* (1912).

Bryan, WILLIAM LOWE (1860–), American educator, was born near Bloomington, Ind. He was graduated (1884) from Indiana University, and studied at Berlin (1886–87), Clark University (1891–92), and Paris and Würzburg (1900–01). He was successively instructor in Greek (1884–85), professor of philosophy (1885–1902), vice-president (1893–1902), and president (1902–) of Indiana University. He was president of the American Psychological Association in 1903; president of the National Association of State Universities in 1911–12; and in 1910 became a trustee of the Carnegie Foundation for the Advancement of Teaching. In collaboration with his wife, he edited *Plato the Teacher: Selections from Plato* (1897); *The Republic of Plato* (1898); *The Spirit of Indiana* (1917).

Bryansk. See BRIANSK.

Bry'ant, JOSEPH DECATUR (1845–1914), American surgeon, was born in East Troy, Wis. He was graduated from the Bellevue Hospital Medical College (1868); and was lecturer there in 1871–74, assistant demonstrator in anatomy in 1875–77, professor of anatomy after 1877, and of anatomy and clinical and orthopedic surgery after 1883; also professor of the principles and practice of surgery in University and Bellevue Hospital Medical Colleges after 1898. He was personal physician to President Cleveland. He wrote: *Operative Surgery* (1905); *American Practice of Surgery* (with A. H. Buck, 8 vols., 1906–11).

Bryant, WILLIAM CULLEN (1794–1878), distinguished American poet and editor, was born in Cummington, Mass., on Nov. 3, 1794, being descended on both sides from *Mayflower* Pilgrims. He attended Williams College for two sessions when sixteen years old; then studied law privately, was admitted to the bar (1815), and practised at Plainfield for one year, and at Great Barrington for nine. At an early age he began to write verse, his first work being published in Boston in 1808, *The Embargo, or Sketches of the Times.* In 1817 his famous poems 'Thanatopsis' and 'To a Water Fowl' appeared in *The North American Review.*

In 1825 Bryant removed to New York, where he was assistant editor of the New York *Review* for one year. In 1826 he joined the editorial staff of the New York *Evening Post,* and three years later became its editor-in-chief and principal owner, a position which he held for fifty years, until his death. As editor he supported the Democratic

Party generally until the nomination of Lincoln in 1860, to whom he gave his support. He died in New York on June 12, 1878. A statue to the poet's memory by Herbert Adams was unveiled in Bryant Park, New York City, in 1911.

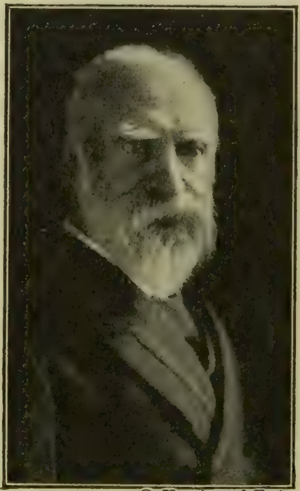
As a journalist Bryant was among the most distinguished of Americans, and his prose style was simple, straightforward, vigorous, and marked by common sense and breadth of view. While editor of *The Evening Post* he made several trips to Europe, described in letters to his paper. These were published as *Letters of a Traveller* (1850), *Letters from Spain and Other Countries* (1859), and *Letters from the East* (1869). Of his numerous addresses on public occasions, a selection appeared in *Orations and Addresses* (1873). His translations of the *Iliad* and *Odyssey* into English blank verse were published in 1870–72.

Bryant is best known as a poet, however. To a tone of noble reflection on life and nature is added mastery of language and of metres. Writing with a restraint that sometimes gives the impression of coldness, he produced blank verse of a high order, and other poetry that gives him an enduring place in American letters. Among his well-known poems are 'A Winter Piece,' 'A Forest Hymn,' 'The River by Night,' 'Among the Trees,' 'Hymn to Death,' 'Life,' 'The Battlefield,' 'Death of the Flowers,' and 'The Song of Marion's Men.'

Bryant's son-in-law, Parke Godwin, prepared the final edition of *The Poetical Works and Prose Works of William Cullen Bryant*, and wrote the standard *Life*. Consult also John Bigelow's *Life* ('American Men of Letters' Series); Stedman's *Poets of America;* Burton's *Literary Leaders of America;* Bradley's *William Cullen Bryant* ('English Men of Letters' Series); W. P. Trent and John Erskine's *Great Writers of America* (1912).

Bryce, George (1844–), Canadian author and educator, was born in Mount Pleasant, Brant county, Upper Canada. He was ordained a Presbyterian minister; was principal of Manitoba College from 1871 to 1884, and professor of English literature there from 1871 to 1909. He was one of the founders of Manitoba University and chairman of its science department (1891–1904); president of the Royal Society of Canada (1909); and a member of the Conservation Commission on Canadian Resources (1909–13) and of the Royal Commission on Technical Education (1910–13). His chief books are: *Manitoba: Its Infancy, Growth, and Present Condition* (1881); *Short History of the Canadian People* (1887; new ed. 1913); *Remarkable History of the Hudson's Bay Company* (1900); *Makers of Canada—Mackenzie, Selkirk, Simpson* (1905); *The Romantic Settlement of Lord Selkirk's Colonists* (1909); *The Scotsman in Western Canada* (1911); *Life of Lord Selkirk* (1912).

Bryce, Viscount James (1838–1922), British statesman, diplomat, and man of letters, was born in Belfast, Ireland. He was educated at Glasgow, Oxford, and Heidelberg, was called to the bar in 1867, and entered the House of Commons in 1880. In 1886 he was Under-Secretary for Foreign Affairs in Gladstone's first administration; in August, 1892, when Gladstone was again in power, he became Chancellor of the duchy of Lancaster, with a seat in the Cabinet; and from May, 1894, to June, 1895, was president of the Board of Trade. The measures he was instrumental in placing on the English statute books include the International Copyright Act (1886), the Railway Rates Act (1894), and the Merchant Shipping Consolidation Act (1895).



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Viscount James Bryce

During the Home Rule debates of 1886 and 1892, Viscount Bryce was a strenuous supporter of Gladstone's proposals. He was a member of the Royal Commission on the Medical Acts, and chairman for some years of the Commons Preservation Society and of the Royal Commission on Secondary Education. In 1902 he became one of the first fellows of the British Academy, and chairman of its historical and archæological committee. In 1905–06 he served as Chief Secretary for Ireland in the Campbell-Bannerman ministry. From February, 1907, to November, 1912, he was British Ambassador to the United States. In 1913 he was appointed a member of The Hague International Prize Court; and on Jan. 1, 1914, was created Viscount Bryce of Dechmont. He served as chairman of the commission appointed by the British government in 1915 to investigate alleged German atrocities in Belgium, and made valuable reports, also, on other phases of the war.

In 1862 Viscount Bryce published *The Holy Roman Empire*, an expansion of his Arnold Prize essay, which placed him in the front rank of historical writers. He also wrote: *Two Centuries of Irish History 1691–1870* (1888); *Impressions of South Africa* (3d ed. 1899); *Studies in History and Jurisprudence* (1901); *Studies in Contemporary Biography* (1903); *Hindrances to Good Citizenship;* (1909); *South American Observations and Impressions* (1912); *University and Historical Addresses* (1913); *Modern Democracies* (1921); *International Relations* (1922). He is best known in the United States by his *American Commonwealth.*

Bryce, Lloyd (1851–1917), American author and diplomat, was born in Flushing, N. Y. He was graduated from Oxford University, and studied law at Columbia University. He was a member of Congress (1887–89), and was proprietor and editor of *The North American Review* from 1889 to 1896. In 1911–13 he was U. S. Minister to the Netherlands and Luxemburg; and was a delegate to the Second International Opium Conference. He wrote: *Paradise* (1887); *A Dream of Conquest* (1889); *The Romance of an Alter Ego* (1889); *Friends in Exile* (1893); *Lady Blanche's Salon* (1899); *The Literary Duet; After Christianity, What?*

Brydges, George. See Rodney, George Brydges.

Bryennios, brē-en′ni-os, Philotheos (1833–), Greek theologian, was born in Constantinople. He represented the Greek Church at the Old Catholic conference at Bonn in 1875, and was chosen metropolitan of Serres (1875), and of Nicomedia (1877). He is the editor of the Clementine Epistles, and the discoverer of the *Didaché, or Teaching of the Twelve Apostles.* See Didaché.

Brym'ner, Douglas (1823–1903), Canadian archivist, was born in Greenock, Scotland. He went to Canada in 1857, settling in Montreal as a journalist. In 1872 he was appointed Archivist of the Dominion of Canada, continuing in office for thirty-one years. His collection of manuscripts—English and French, originals and copies—amounted to 3,155 volumes, and his reports, published by the Department of Agriculture, contained abstracts of many valuable papers in the Canadian archives.

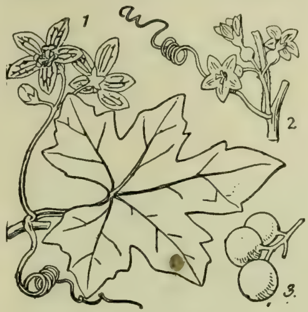
Brynmawr, brin-mär, town, Brecknockshire, Wales, on the London and Northwestern Railway; 8 miles southwest of Abergavenny. It has coal mines and iron works. Pop. (1911) 7,592.

Bryn Mawr College, a leading institution of higher education for women at Bryn Mawr, Pa.; 10 miles northwest of Philadelphia. The college was established through the gift of Dr. Joseph W. Taylor, who purchased the site and left the greater part of his estate to the college. It was incorporated in 1880, and instruction was begun in 1885. The general scheme of instruction is based on the university model. Three classes of persons are admitted—graduate and undergraduate students and hearers. Graduate Departments of Education and of Social Economy and Social Research were opened in 1913 and in 1915.

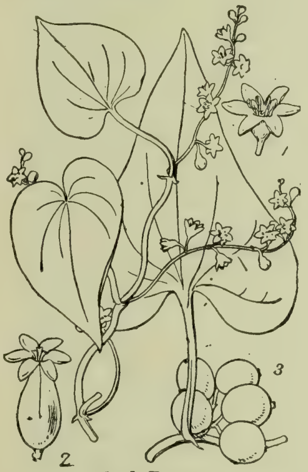
There are twenty fellowships of the value of $810 awarded annually in various departments, the holders of which must reside in the college, wear academic dress, and assist in examinations, and one resident research fellowship of the value of $1,200 for research in physics or chemistry. Twenty graduate scholarships of the value of $350 each are offered to graduate students next in rank to the fellows. There are several other graduate scholarships varying in value from $350 to $550; and nine graduate scholarships (established in 1909), of $720 each, open to women of British, German, French, Spanish, Italian, Swiss, and Scandinavian nationalities. In addition, three European fellowships of $500, one of $700, and one of $1,500, are open to graduate students to defray the cost of one year's study at a foreign university. Hearers must be women of at least twenty-five years of age, who have at some time pursued studies included in the matriculation examination. They receive no degrees. Candidates for the degree of master of arts must be graduates of Bryn Mawr, or must have completed a course corresponding to the Bryn Mawr undergraduate course in a college or university of good standing. The doctor's degree may also be conferred upon graduates of other institutions. Residence in the college buildings is required of undergraduates. For recent statistics see Table of American Universities and Colleges under the heading College.

Bryology, the study of Mosses (q. v.).

Bry'ony. In Europe, two unrelated climbing plants are known by this name. One is the white-rooted *Bryonia dioica*, of the gourd family, with white flowers and palmate leaves, with tendrils at their bases, and red berries in fall; its root has purgative properties. The other, or black byrony (*Tamus communis*), known also as Our Lady's Seal, belongs to the yam family, and has tiny greenish flowers and elliptical red berries; the leaves are heart shaped.



White Bryony.
1, Male flower; 2, female flower; 3, fruit.



Black Bryony.
1, Male flower; 2, female flower; 3, fruit.

Bryophytes. See Mosses.

Bryozo'a ('moss animals'), a name of the Polyzoa (q. v.).

Bry'um, a large genus of common mosses, forming small, dense patches on damp earth and rocks. The capsules are pear-shaped, with a double row of transverse teeth, and are pendent at the end of the stems.

Brzesc. See Brest Litovsk.

Brzezany, bzhe-zhä'ni, town, Galicia; 31 miles southwest of Tarnopol. In the course of the Great War it was occupied by the Russians (September, 1914), but was evacuated a year later towards the end of their great retreat. Pop. (1900) 11,244; (1911) 12,626.

Brzeziny, town, Russian Poland, Piotrkov government; 14 miles east of Lodz. It has woollen manufactures. Pop. 8,000.

B. Th. U., or British Thermal Unit, is the unit quantity of heat employed by engineers. It is the amount of heat required to raise the temperature of 1 lb. of water from 49° to 50° F., and is mechanically equal to 778 foot-pounds of work.

Bubalis. See Harte-beest.

Bubas'tis, once a famous city, now a heap of ruins (Tell Basta), in the Nile delta, Lower Egypt; 1 mile from Zagazig, capital of Sherkûjeh province. It was the Pi-beseth of Ezekiel xxx. 17, and is described from personal knowledge by Herodotus under its Greek name of Bubastis. It had a magnificent temple to the goddess Bast, the Egyptian Artemis, which was a place of pilgrimage. It was captured by Mentor, the general of Artaxerxes III., and began to decay after the foundation of Naucratis, and especially after the foundation of Alexandria. The ruins of its great temple were discovered by M. Naville in 1887, and extensive excavations next year revealed that Bubastis was once the seat of a great Hyksos settlement.

Bubble-shell (Bulla), a genus of gasteropod molluscs in which the oval shells are thin, with a concealed spire, and usually prettily marked with blotches of color on a pale ground. The species are widely distributed in both tropical and temperate seas, in shallow water.

Bubble, South Sea. See South Sea Scheme.

Bubo. See Owl.

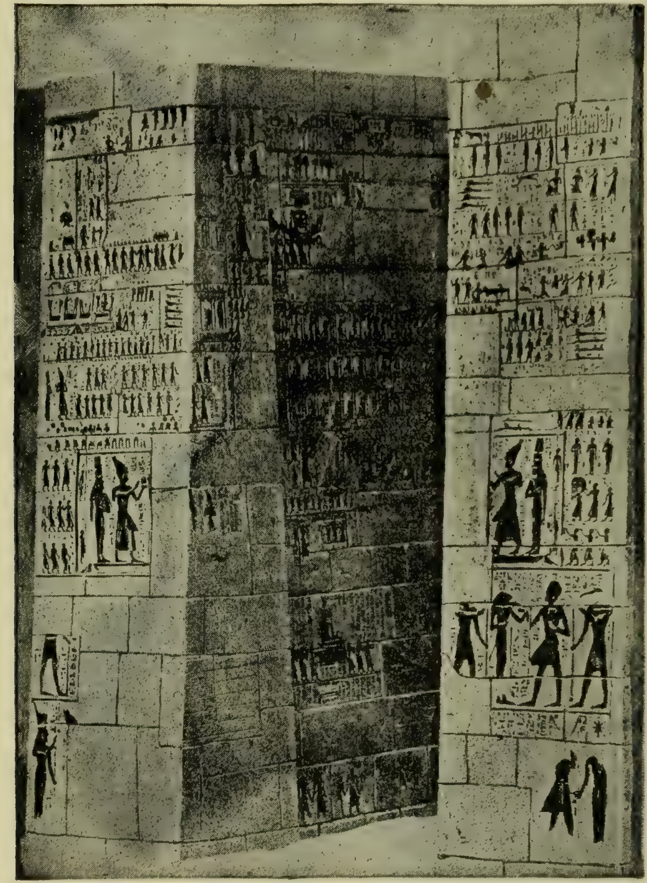
Bubo, an inflammatory swelling of a lymphatic gland in any part of the body. The term is usually confined to swelling of the glands of the groin. Buboes are divided into (1) *simple*, due to inflammation of a gland through ordinary irritation from an inflamed surface; (2) *specific*, an abscess inoculated with the pus of a chancre; and (3) the indolent enlargement of the lymphatic glands which accompanies the development of the initial sore of syphilis.

Treatment includes rest in bed, hot fomentations, baths, opening freely, curetting, and antiseptic dressing. Should such treatment fail, the diseased glands must be excised.

In the most frequent form of plague, buboes appear early, situated in neck or groin, for the most part. Hence the term 'bubonic plague.' See Plague, Bubonic.

Bubonic Plague. See Plague, Bubonic.

Bucaramanga, bōō-kä-rä-mäng'gä, capital of the department of Santander, Colombia, on the Lebrija River, at an elevation of 3,250 feet. It is one of the three great coffee markets of Colombia, and is also an important centre for tobacco and cotton. Iron, copper, and gold, and allied minerals are found in the region. The streets are wide, and the city is lighted by electricity. It has a Pedagogic Lyceum founded in 1912, and a School of Arts and Crafts. Pop. (1912) 19,755.



Bubastis.—*Gateway of the Temple of Osarkon II.*

Buccaneers′, or Filibusters, piratical adventurers of divers nationalities who preyed upon Spanish trade and property in the West Indies and on the neighboring mainland in the seventeenth century. The buccaneers were originally smugglers, who made San Domingo and Tortuga their headquarters. San Domingo was full of wild cattle, and the buccaneers took their name from the grating or barbecue on which the flesh was roasted, which in the Indian language was called a *boucan.* The flesh was called *viande boucannée,* and the hunters *boucaniers.* Eight years later, Spain destroyed this settlement; but the adventurers returned in force, and thenceforward, for about seventy years, were the terror of the Spaniards in that part of the world. The British conquest of Jamaica in 1655 gave the buccaneers a new headquarters. New Segovia, in Honduras, was taken and sacked in 1654; Maracaibo and Gibraltar, on the Gulf of Venezuela, were plundered; and Providence, in the Bahamas, was settled by the freebooters. The leaders among the earlier buccaneers were Montbars and Olonnais, Frenchmen, Mansvelt, and Henry Morgan (q. v.), a Welshman.

Morgan distinguished himself especially by the capture and sack of Porto Bello; but his successes, directed from Jamaica, induced Great Britain and Spain, in 1670, to conclude a treaty, in virtue of which buccaneering was to be suppressed. Morgan and his friends revolted against this, and in 1671, with a fleet of thirty-nine vessels, crossed to the mainland, traversed the isthmus, and took and burned the rich town of Panama, with circumstances of great cruelty and outrage.

A second time the outlaws took Porto Bello. In 1680 they again crossed the Isthmus of Panama, took Santa Maria, and embarked on the Pacific under John Coxon. Defeating a Spanish squadron, various bands, under Sharp, Watling, and Sawkins, pushed south to the coasts of Peru and Chile, and returned to Cape Horn. In 1683 Van Horn, with six vessels and 1,200 men, plundered Vera Cruz.

Another body of priates, under John Cook, in 1683 went by Cape Horn, picked up at sea a vessel which had been sent out to them by English sympathizers under the command of one Eaton, and after Cook's death served under Edward Davis and Swan in the Pacific, pushing up to Panama, and being there joined in 1685 by more buccaneers, who had crossed the isthmus—one body under Grogniet and L'Escuyer, and another under Townley and others. They won extraordinary successes, but fell out among themselves, the result being that the French and English deserted each other.

The buccaneers were further divided by the war which broke out between Great Britain and France in 1689, and in 1697 they were very roughly handled by a combined English and Dutch fleet outside Cartagena. After the Treaty of Ryswick they were discountenanced by both England and France, and from that time they gradually disappeared, although bands of pirates lingered on at Providence in the Bahamas. William Dampier (q. v.), the navigator (later in the royal navy), served with Cook, Davis, and Swan. See Filibuster; Piracy.

Consult Burney's *History of the Buccaneers of America;* Stockton's *Buccaneers and Pirates of Our Coasts;* Masefield's *On the Spanish Main;* Dampier's *Voyages* (2 vols.); Brand's *Free Lances;* Roche's *By Ways of War*; Pyle's *Adventures of Pirates and Sea Rovers;* Esquemeling's *Buccaneers of America;* Haring's *Buccaneers in the West Indies in the Seventeenth Century;* Johnston's *Famous Privateersmen and Adventures of the Sea.*

Buccinum. See Whelk.

Buccleuch Family, buk-klo͞o. The Border house of the Scotts of Buccleuch is traced back to Sir Richard le Scot, a man of distinction in the reign of Alexander III. of Scotland. He died in 1320, and from him was lineally descended Sir David Scot of Branxholm, who sat in the Parliament held by James III. at Edinburgh in 1487, under the designation of 'Dominus de Buccleuch,' being the first of the family so designated. His grandson was Sir Walter Scott of Branxholm and Buccleuch, who figures in the *Lay of the Last Minstrel*, written by his famous namesake. The first 'Lord Scott of Buccleuch' was Sir Walter Scott, warden of the Western Marches, who is celebrated for his rescue of one of his attendants, 'Kinmont Will,' from the castle of Carlisle. He was elevated to the peerage in 1696 as Lord Scott of Buccleuch, and afterwards won distinction in the Netherlands under Maurice, Prince of Orange. The title Earl of Buccleuch was granted in 1619 to one of the family who served as commander of a regiment under the states of Holland against the Spaniards. The granddaughter of this Sir Walter, Anne, Countess of Buccleuch, married, in 1663, the Duke of Monmouth, illegitimate son of Charles II., and they were created Duke and Duchess of Buccleuch. The duke's honors were forfeited on his execution in 1685, but those of the duchess in her own right remained unaffected by the attainder. Upon her death, in 1732, her grandson Francis succeeded to the title of Duke. One of the branches of the Buccleuch family was that of Harden, which produced the Scotts of Raeburn, ancestors of Sir Walter Scott. In 1914 John Charles Montagu-Douglass-Scott succeeded to the dukedom as 7th Duke.

Bucentaur, bū-sen′tôr, the name of the state galley of the republic of Venice, in which the doges annually, from 1311 to 1789, on Ascension day, 'married the Adriatic,' in token of Venetian supremacy over the seas. This custom is traced to a naval victory gained on Ascension day in 1177 by Doge Sebastiano Liani over the emperor Frederick Barbarossa. The last *Bucentaur*, made in 1722–9, was burned by the French in 1798.

Bucephala, bū-sef′*a*-la, a city on the Hydaspes (the Jhelum), in Northern India, founded by Alexander the Great in 326 B.C., in honor of his horse Bucephalus.

Bucephalus, bū-sef′*a*-lus, favorite charger of Alexander the Great, which died on the banks of the Hydaspes in Northern India in 326 B.C.

Bu′cer, or BUTZER, MARTIN (1491–1551), German reformer, was born in Lower Alsace. He entered the Dominican order at fifteen, but was converted in 1518 by Luther and the writings of Erasmus to the reformed faith. In 1521, having been released from his monastic vows, he became court preacher to the Elector Palatine, and in 1523 pastor in Strassburg, which was henceforth the centre of Protestant learning. In the controversy between Luther and Zwingli concerning the eucharist, Bucer endeavored to steer a middle course, although he and his followers were inclined to support the views of Zwingli, with the result that he incurred Luther's stern disapproval. He brought about the conference at Marburg (1529), at which he attempted unsuccessfully to reconcile Luther and Zwingli; and attended the Augsburg Diet, but being unable to accept the Interim, he went, at Cranmer's invitation, to England, where he was a lecturer at Cambridge University until his death. In 1556, in the reign of Queen Mary, his body was exhumed and publicly burned. His *Correspondence* with the Landgrave Philip of Hesse was published by Lenz in 1880–91.

Buch, bo͝ok, CHRISTIAN LEOPOLD VON, BARON VON GELMERSDORF (1774–1853), Prussian geologist, was born in the castle of Stolpe, in the Ukermark. He contributed largely to the development of geological science, though his extreme view of the Vulcanian theory of the origin of the earth's crust is no longer tenable. In 1815 he accompanied the botanist Smith to the Canaries, and published *Physikalische Beschreibung der Kanarischen Inseln* (1825). Besides this he wrote *Beiträge zur Bestimmung der Gebirgsformationen in Russland* (1840) and *Betrachtungen über die Verbreitung und die Grenzen der Kreidebildungen* (1849). He prepared an admirable geognostic chart of Germany in forty-two sheets (2d ed. 1832), and wrote monographs on the Terebratula (1834), Spirifers (1838), Leptæna (1842), and Ceratites (1849). A complete edition of his works appeared in 4 volumes in 1867–85.

Buchan, buk′*a*n, district, now included in Banffshire and Aberdeenshire, Scotland, lies between the rivers Deveron and Ythan. The coast line of 40 miles is mostly bold and rocky, especially at the Bullers ('boilers') of Buchan, 6 miles south of Peterhead, a huge vertical well into which the sea rushes by a natural archway. It was formerly a haunt of smugglers.

Buchan, ALEXANDER (1829–1907), Scottish meteorologist, became secretary to the Scottish Meteorological Society in 1860, and after 1878 was curator of the library and museum of the Royal Society of Edinburgh. His works include, *Handy Book of Meteorology* (1867), *Introductory Textbook of Meteorology* (1871), and *Atmospheric Circulation and Oceanic Circulation* (*'Challenger' Reports* for 1889 and 1895).

Buchan, DAVID (1780–?1837), British explorer. In 1818 he and Lieut. John Franklin received the command of two vessels, the *Dorothea* and the *Trent*, with the charge to find a way from the Atlantic to the Pacific Ocean. Buchan, however, was unable to get beyond Spitzbergen. He was appointed high sheriff of Newfoundland in 1825, and a few years later sailed into northern seas, but never returned.

Buchan, ELSPETH (1738–91), Scottish religious enthusiast, was the daughter of a Banffshire innkeeper. Having pretended to miraculous powers, she and her followers were expelled from Irvine, and established themselves near Closeburn, Dumfriesshire. According to Robert Burns they held community of goods and of women.

Buchan, JOHN (1875–), Scottish historian and novelist, was born in Perth. He was educated at Glasgow University and at Oxford, entered the publishing business, and became a member of the firm of Thomas Nelson & Sons. He was private secretary to the High Commissioner for South Africa from 1901 to 1913, was on the Headquarters Staff of the British Army in France in 1916 and 1917, and was Director of Information under the Prime Minister in 1917 and 1918. His publications include *Sir Quixote* (1895); *Musa Piscatrix* (1896); *A History of Brasenose College* (1898); *The Half-hearted* (1900); *The Watcher by the Threshold* (1902); *A Lodge in the Wilderness* (1906); *Prester John* (1910); *Sir Walter Raleigh* (1911); *Salute to Adventurers* (1915); *Greenmantle* (1916); *The South African Forces in France* (1920); *Francis and Riversdale Grenfell* (1920); *A Book of Escapes and Hurried Journeys* (1922); *A History of the Great War* (1921–2).

Buchan, WILLIAM (1729-1805), Scottish physician, a native of Ancrum, Roxburghshire, practised medicine in Ackworth (Yorkshire), Sheffield, Edinburgh (*c.* 1766), and after 1778 in London, where he was well known for his medical skill, convivial habits, and great benevolence. His chief work, *Domestic Medicine* (1769), the first English book of its kind, reached its twenty-first edition in 1813.

Buchanan, bū-kan′*a*n, village, Michigan, on the St. Joseph River, and on the Michigan Central and the Pere Marquette Railroads; 27 miles south of Benton Harbor. Manufactures include high speed machine tools, motor truck axles, and tractors. Pop. (1910) 1,831; (1920) 3,187.

Buchanan, FRANKLIN (1800–74), American naval officer, was born in Baltimore, Md. He entered the navy as a midshipman in 1815, served some years at sea, became lieutenant in 1825, and master-commandant in 1841. In 1845 he was chosen by the Secretary of the Navy to organize the Naval Academy at Annapolis, and for two years was its superintendent, leaving this position to take part in the Mexican War, during which he participated in the capture of Vera Cruz. He went with Perry's expedition to Japan, 1852–55, was made a captain in 1855, and became commander of the Washington Navy Yard in 1859. He entered the Confederate Navy in 1861, commanded the *Merrimac* in the attack on the Federal fleet in Hampton Roads, and for his gallantry was promoted to admiral of the Confederate Navy. He commanded the *Tennessee* in the battle of Mobile Bay (1864) and was wounded and taken prisoner, but was exchanged the following February. After the war he was for a time president of the Maryland Agricultural College.

Buchanan, GEORGE (1506–82), Scottish historian and scholar, was born in Killearn, near the southeast shore of Loch Lomond. In 1520–22 he studied 'the humanities' at the University of Paris, was later a student at St. Andrews (B.A., 1525), and in 1526 returned to Paris, where he entered the Scottish College and obtained the M.A. degree (1528). For some years he held a professorship in the college of Sainte Barbe, but in 1535 returned to Scotland, where he was engaged by King James V. as tutor to one of the king's natural sons, James Stewart, later abbot of Kelso. A satire entitled *Somnium*, in which the ignorance and depravity of the monks were held up to contempt, brought Buchanan into great disfavor and when, at the instigation of the king, he published two others, *Palinodia* and *Franciscanus*, he was arrested and imprisoned. Escaping, he fled to England and then to France, where he taught in Bordeaux and in Paris. In 1547 he went to Coimbra, Portugal, and there taught in the newly established University, but his Protestant views were looked upon with suspicion by the Portuguese clergy and he was confined in a monastery, where he began his beautiful translation of the Psalms into Latin. In 1551 he was released, returned to England, and then went to France. His tragedy *Jephthes*, written at this time, he dedicated to the Maréchal Comte de Brissac, who appointed the writer tutor to his son. In 1561 Buchanan again returned to Scotland, and was thereafter successively classical tutor to the young Queen Mary, principal of St. Leonard's College, St. Andrews (1566), and moderator of the General Assembly of the Reformed Church of Scotland (1567), of which he had become a member about 1562. His sympathies were consequently all on the side of the Protestant lords in their revolt against Queen Mary; and his sentiments were displayed with much arrogance and vehemence in his *Detectio Maria Regina* (1569).

On the assassination of the Regent Moray (1570), the queen being now a prisoner to her cousin Elizabeth, Buchanan was chosen as one of the preceptors of the boy-king, to whom he afterwards dedicated his *De Jure Regni apud Scotos* (1579), and who owed to this erudite instructor the scholarly attainments which distinguished him in after life. The closing event of his life was the publication (1582) of his famous *History of Scotland*. Two editions of his works have been published, one edited by Ruddiman (2 vols. 1715), and one by Burman (1725). Consult Irving's *Life of Buchanan;* P. Hume Brown's *George Buchanan, Humanist and Reformer*.

Buchanan, JAMES (1791–1868), fifteenth President of the United States, was born, of Scotch-Irish descent, near Mercersburg, Pa., on April 23, 1791. He was graduated from Dickinson College, Carlisle, Pa., in 1809, was admitted to the bar in Lancaster, Pa., in 1812, and soon became prominent both as a lawyer and as a political leader, being first a Federalist and afterward a Jackson Democrat. From 1821 to 1831 he was a representative in Congress; in 1831–3 he was U. S. minister to Russia, negotiating a commercial treaty with that country (1832); and from 1833 to 1845 was a member of the U. S. Senate, in which he showed ability in debate but did not connect his name with any measure of lasting importance. He was Secretary of State in the cabinet of President Polk (1845–9), during a period marked by the Oregon boundary treaty, the annexation of Texas, and the Mexican War. From 1853 to 1856 he was U. S. minister to Great Britain, and during this time was one of the signers of the Ostend Manifesto (q. v.). In the national Democratic conventions of 1844, 1848, and 1852, he had received votes for the presidential nomination; in that of 1856 he was nominated, and in the ensuing election he defeated his Republican opponent, Frémont, by 174 to 114 electoral votes.

Buchanan's administration (1857–61) covered a particularly trying and critical period in the history of the country, and his policy has been severely criticised, perhaps often unjustly so. He was a conservative man, personally opposed to slavery but believing that unadvised interference by the North in the domestic concerns of the South was bound to create a state of affairs dangerous to the peace and prosperity of the nation. His cabinet was divided in its sympathies, some of its members being outspoken secessionists. Buchanan himself denied the right of secession and in this he remained firm, but being a man of mediocre attainments he wished as far as possible to proceed along the line of least resistance and therefore determined to leave to his successor the weathering of the storm then brewing.

During his administration diplomatic affairs were on the whole handled satisfactorily; the success of the Atlantic cable was first assured; Minnesota and Oregon were admitted to the Union; the Dred Scott decision was rendered by the Supreme Court. Upon the actual outbreak of hostilities Buchanan reorganized his cabinet, surrounding himself with men of strong character and ability, such as J. S. Black, John Dix, and Edwin M. Stanton, under whose influence he displayed greater firmness and confidence in the handling of affairs. Consult Buchanan's own defence of his policy, *Mr. Buchanan's Administration on the Eve of the Rebellion* (1866); Curtis' *Memoir* (2 vols.); Rhodes' *History of the United States from the Compromise of* 1850 (5 vols); *The Works of James Buchanan* comprising his Speeches, State Papers, and Private Correspondence, edited by John Bassett Moore.

Buchanan, ROBERT CHRISTIE (1811–78), American soldier, was born in Baltimore, Md., and was graduated (1830) from West Point. He served in the Black Hawk, Seminole, and Mexican Wars, and in the Civil War, during which he took part in the siege of Yorktown, in the battle of Gaines' Mills, the second battle of Bull Run, and in the Maryland and Rappahannock campaigns. He was appointed brigadier-general of volunteers in November 1862, and for his services at Manassas and Fredericksburg he was brevetted major-general U. S. A. in 1865.

Buchanan, ROBERT WILLIAMS (1841–1901), English poet, novelist, and dramatist, was born in Warwickshire, of Scottish parents, and was educated at the University of Glasgow. His first volume of poems, *Undertones*, appeared in 1860; but he rose to a much higher level in his *London Poems* (1866), in which the life of the poor of London is vividly, humorously, and pathetically described. Among his subsequent poetical works are *The Book of Orm* (1870), *Balder the Beautiful* (1877), *The City of Dreams* (1888), and *The Wandering Jew: a Christmas Carol* (1893). A complete edition of his verse was published in 1901. His miscellaneous works include *The Land of Lorne* (1871), *David Gray* (1868), and *The Hebrid Isles* (1882); his novels, *The Shadow of the Sword* (1876), *God and the Man* (1881), *The New Abelard* (1884), *The Heir of Linne* (1888), *Rachel Dene* (1894), and *The New Rome* (1899). In conjunction with H. Murray, he also wrote *The Charlatan* (1895). As a playwright he achieved success with *Lady Clare*, *Sophia*, and *Joseph's Sweetheart*.

Buchanan, WILLIAM INSCO (1853–1909), American diplomat, was born near Covington, O., settled in Sioux City, Ia., in 1882; and organized and managed the first four 'corn palace' exhibitions there. He was Minister to Argentina, 1894–1900; deciding arbitrator in the Argentina-Chile boundary dispute, 1899; director-general of the Pan-American exposition, Buffalo, 1901; delegate to the 2d and 3d Pan-American conferences, 1901–2 and 1906; first U. S. Minister to Panama; delegate to the Hague Peace Congress, 1907; High Commissioner at the inauguration of the International Court of Justice at Cartago, Costa Rica, 1908; High Commissioner to Venezuela, 1909; and, at the time of his death, agent for the United States in the one case at the Hague Court between the United States and Venezuela which had not been settled by his diplomacy.

Buchanites. See BUCHAN, ELSPETH.

Bucharest, bo͞o-*ka*-rest', or BUKHAREST, city, capital of Roumania, is situated on both banks of the Dimbovitza, in the midst of a fertile plain, 30 miles north of the Danube. Modern fortifications surround the city, and twelve bridges span the river here. On the right bank stands the old town, with many monuments and ruins; on the left is the modern city, including the business section. Although many of the streets are narrow and crooked, the city as a whole is attractive. There are several beautiful public gardens, the most noteworthy of which are the Cismegin and the Shoseaua Kisselef, and the Strada Lipscani and the Calea Victoriei are fine thoroughfares. Notable public buildings are the Royal Palace, National Bank, National Theatre, Post Office, Athenæum, Art Gallery, Library, University, and Law Courts. Of churches, mention may be made of the Cathedral (1656), which occupies a commanding site above the city, the Domnitza Balasa, in Byzantine style, lavishly decorated; St. Spiridon (rebuilt in 1890), and the chapel Stravropolos, small, but a gem of Byzantine art. Bucharest is the seat of a university (founded in 1864), two Greek-Orthodox seminaries, an academy of arts, a conservatory of music, and the Roumanian Academy of Sciences.

Manufacturing is yet in its infancy, but commerce is well developed, Bucharest being the distributing centre for Roumania, as well as for some parts of the Balkan Peninsula. The population, which is mixed, numbers 308,987 (1917).

In 1698 Bucharest became the capital of Wallachia. It was pillaged by the Serbians in 1716, and was occupied by the Russians in 1769, by the Austrians in 1789, by the Russians again in 1828 and in 1853, and again by the Austrians in 1854. In 1862 it became the capital of Roumania. A number of important treaties have been signed in Bucharest. Negotiations between Russia and Turkey in May 1812 resulted in the cession of Bessarabia and a part of Moldavia to Russia; in 1913 the Treaty of Bucharest settled the status of parts of European Turkey captured during the second Balkan War (q. v.); and in May, 1918 the Roumanians here signed what is known as the Peace of Bucharest, which terminated hostilities with the Central Powers.

Bucharest, TREATY OF. See BALKAN WAR 1913.

Bucher, bo͞ok'*er*, LOTHAR (1817–92), German politician, was born in Neu-Stettin. In 1848 he was elected to the National Assembly, and became a democratic leader. With others he was condemned to imprisonment for refusing to pay taxes, but escaped to England, where he acted as correspondent to the *National Zeitung*. In 1860 he returned to Germany, received an appointment in the Foreign Office, and became Bismarck's private secretary. He was responsible for the constitution of the North German Confederation, and was intermediary in the Hohenzollern overtures for the Spanish crown.

Buchez, bü-shā', PHILIPPE BENJAMIN JOSEPH (1796–1865), French philosopher and politician, was born in Matagne-la-Petite (now in Belgium). A thorough democrat, he took part in numerous conspiracies against the Bourbons, and was one of the founders of the French Carbonari Society, which made several attempts at revolution. About 1825 he attached himself to the St. Simonian Society, but left it in 1829, and shortly afterward founded a Neo-Catholic school, and, to expound the doctrines of Buchezism, published a periodical, *L'Européen* (1831–48). Expositions of his theory of the progress and development of the human race are contained in *L'Introduction à la science de l'histoire* (1833), *Essai d'un traité complet de philosophie au point de vue du catholicisme et du progrès* (1839–40), and *Traité de politique et de science sociale* (1866). In conjunction with Roux Lavergne he published *L'Histoire Parlementaire de la Révolution Française* (40 vols. 1838–)—one of the chief sources of information regarding the French Revolution. Following the Revolution of 1848 he was president of the Constituent Assembly.

Buchholz, bo͞ok'hōlts, town, Saxony, on the Sehma River; 36 miles south of Chemnitz. Its most important building is the parish church built in the sixteenth century, which contains some good paintings. Lace making, bookbinding and the manufacture of paper are the leading industries. Pop. (1910) about 9,300.

Büchner, bü*ch*'ner, EDUARD (1860–1917), German chemist, was born in Munich. He was educated in Munich and Erlangen, lectured in chemistry at Munich, and held professorships at Kiel, Tübingen, the Agricultural College of Berlin, and Breslau. In 1907 he received the Nobel prize in chemistry for his discovery that the liquid obtained by crushing yeast with fine quartz sand and subjected to intense pressure possesses the power of setting up fermentation in solutions of grape sugar, maltose, invert sugar, etc. He died of wounds received while serving as a major in the Great War.

Büchner, FRIEDRICH KARL CHRISTIAN LUDWIG (1824–99), German physician and naturalistic philosopher, was born in Darmstadt, and qualified for the medical profession. He became lecturer in the university at Tübingen and in 1855 brought out his *Kraft und Stoff*, in which he attempted scientifically to establish a materialistic view of the universe. The work aroused violent controversy and its author was obliged to resign his post at the university. His later writings were devoted to the popularization of Darwinism and similar theories. Of these works may be mentioned *Die Darwinsche Theorie* (5th ed. 1890); *Der*

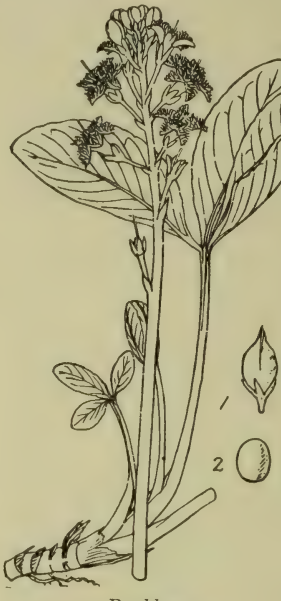
Mensch und seine Stellung in der Natur (1870; 3rd ed. 1889), translated into Eng. under the title *Man in the Past, Present, and Future* (1872); *Der Fortschritt in Natur und Geschichte im Licht der Darwinschen Theorie* (1884); *Das goldene Zeitalter oder das Leben von der Geschichte* (2nd ed. 1891); *Die Macht der Vererbung* (1882); *Das künftige Leben und die moderne Wissenschaft* (2nd ed. 1889).

Buchtel College, former name of the University of Akron. See Akron.

Buck, Dudley (1839–1909), American composer and organist, was born in Hartford, Conn. He was at Trinity College for three years, and in 1858 went to Europe, where he spent four years studying music in Germany and France. In 1862 he returned to Hartford and became organist in the North Congregational Church. In 1869 he went to Chicago, remained there as organist in St. James Church for three years, and removed to Boston in 1872. He went to Brooklyn, N. Y., in 1875, and in 1877 became conductor of the Apollo Club and organist and choirmaster at Holy Trinity Church, where he remained until his retirement from church work in 1903. He was a member of the National Institute of Arts and Letters. His compositions include much church and secular music, including the opera *Serapes;* the comic opera *Deseret, The Legend of Don Munio, Marmion, The Golden Legend, The Light of Asia, The Voyage of Columbus,* many short cantatas, and several song sequences for the Apollo Club. He published also a *Dictionary of Musical Terms.*

Buck, Leffert Lefferts (1837–1909), American engineer, was born in Canton, N. Y. He was educated at St. Lawrence University and at Rensselaer Polytechnic Institute, served in Civil War, and was made captain for bravery. He was a noted bridge builder, constructing many bridges in the United States and South America. He rebuilt the suspension bridge at Niagara Falls, and while chief engineer of the Bridge Department in New York City, built the Williamsburg Bridge and had charge of the Manhattan Bridge plans.

Buckbean, Marsh Trefoil, or Bog Bean (*Menyanthes trifoliata*), a plant belonging to the order Gentianaceæ, common to most parts of the United States. It grows in moist places, having a creeping jointed rootstock and a procumbent stem, 6 to 12 inches high. The three-foliolate leaves are glabrous and long petioled; the bearded white or reddish flowers are borne on tall peduncles. The leaves are bitter, and from them is prepared an extract used in stomach troubles and in intermittent fevers. In Germany it is sometimes used in the place of hops.



Buckbean.
1. Seed vessel. 2. Seed.

Bucket Shop, an establishment conducted ostensibly for the buying or selling of stocks or commodities, but actually with no intention of receiving and paying for the property so bought or of delivering the property so sold; in practice, therefore, simply a concern for the placing of wagers on the fluctuation of market prices. Its method of operation, generally speaking, is the same as that of the legitimate broker trading in margins, except that it does not buy the stock bargained for, or, if it does, soon sells it again instead of using it as collateral security for loans in order to get the money necessary to complete payment on the purchase. In other words, it accepts a portion of the purchase price, charges interest on the balance, and if the market falls calls for more margin, without, however, rendering any service whatever. It is obvious, therefore, that bucket shops enjoy greater prosperity in a declining market. The clients reach the point where they cannot offer additional margin, and their accounts are closed out. As the bucket shop has never purchased the securities bargained for, the customer's loss is its profit. In an advancing market conditions are different, the client takes his profits or demands his securities, and as these demands multiply the establishment closes its doors and takes refuge in bankruptcy. Market manipulation to bring prices to a point where the account may be closed out and other dishonest practices add to the menace of the bucket shop.

The New York Stock Exchange began a war on bucket shops as early as 1878; other exchanges have also conducted anti-bucketing campaigns, and many of the States have enacted legislation prohibiting their operation.

Buckeye, the Horse Chestnut (q. v.).

Buckeye State, popular name of the State of Ohio.

Buckhannon, buk-an′an, city, West Virginia, county seat of Upshur county, on the Buckhannon River, and on the Baltimore and Ohio Railroad; 90 miles northeast of Charleston. The West Virginia Wesleyan College is located here. Pop. (1910) 2,225; (1920) 3,785.

Buckie, town, Scotland, on the North Sea; 15 miles east of Elgin. It is a fishing town, with a good harbor. Pop. (1921) 8,690.

Buckingham, town, Canada, province of Quebec, on the Rivière du Lièvre, and on the Canadian Pacific Railroad; 20 miles northeast of Ottawa. Mining of phosphate, mica, and plumbago is carried on in the vicinity. Pop. (1921) 3,835.

Buckingham, George Villiers, First Duke of (1592–1628), was the second son of a Leicestershire knight, Sir George Villiers. In 1614 he entered the service of the court, where his handsome person and engaging manners early won him favor and rapid promotion. In the course of two years after the fall of Carr, Earl of Somerset (1616–18), he was knighted, and was created successively Viscount Villiers, Baron Waddon, Earl of Buckingham, and Marquis of Buckingham. In 1620 he married the daughter of the Earl of Rutland, the richest heiress in the kingdom. During the negotiations for a treaty of marriage between Prince Charles and the Spanish Infanta, Buckingham accompanied the prince on his fruitless mission to Spain; and he continued to maintain his ascendency after Charles' accession to the throne in 1625. Those events which culminated in the failure of the expedition against Cadiz greatly diminished his popularity, however, and on two occasions his impeachment was attempted, but each time this measure was thwarted by the dissolution of Parliament by the king. In 1627 Buckingham commanded a fleet sent to relieve La Rochelle; but he was unsuccessful, and returned in disgrace to England. The following year he planned a second expedition against La Rochelle, and proceeded to Portsmouth to embark, but was there stabbed to the heart by a disappointed officer named John Felton. Buckingham's character has been portrayed by Scott in *The Fortunes of Nigel.*

Buckingham, GEORGE VILLIERS, SECOND DUKE OF (1628–87), son of the First Duke of Buckingham, was born at Wallingford House, Westminster. On the outbreak of the civil war he served with the royal forces at the storming of Lichfield Close (1643) and at the restoration he became one of the most powerful men at court. The downfall in 1667 of the chancellor Clarendon made him paramount; and Pepys records that at this time the king had 'become a slave to the Duke of Buckingham.' Buckingham, however, became more and more deeply involved in political intrigues, notably with France, until at length, in 1674, the king definitely threw him over in consequence of pressure from both houses of Parliament. At the accession of James II. his public career was practically at an end. Buckingham was an accomplished courtier, and the author of certain satirical poems, political pamphlets, and a comedy entitled *The Rehearsal,* which held the stage for a long time, and probably inspired Sheridan's *Critic.* The latter was first printed in 1672; his *Miscellaneous Works* in 1705. He was buried in Westminster Abbey. Sir Walter Scott has portrayed Buckingham in *Peveril of the Peak;* and the author of *Hudibras* has delineated him with merciless accuracy in 'A Duke of Bucks' (Thyer's *Genuine Remains of Samuel Butler,* ii. 72, ed. 1759).

Buckingham, WILLIAM ALFRED (1804–75), American public official, was born in Lebanon, Conn., the son of a farmer. He received a public school education, and subsequently settled in Norwich, Conn., where he became a successful merchant and manufacturer. He was mayor of the city for several terms and was 'war governor' of Connecticut, holding office from 1858 to 1866, and raising 55,000 troops from his State, without recourse to the draft, greatly exceeding the State's quota. He was U. S. Senator from Connecticut from 1869 until his death. Governor Buckingham was prominent as a temperance advocate and was known for his philanthropy.

Buckingham and Normanby, DUKE OF. See SHEFFIELD, JOHN.

Buckinghamshire, or BUCKS, inland county of England, with Northamptonshire on the north, the Thames on the south, Oxfordshire on the west, and Middlesex, Bedfordshire, and Hertfordshire on the east. Its greatest length is 53 miles; its greatest breadth 27 miles; its area nearly 749 square miles. The chief rivers are the Thames, Ouse, Ousel, Thame, and Colle. The Chiltern Hills in the east central part are covered with magnificent forests of beeches. The northern part is largely given to pasturage; the vale of Aylesburg in the centre is one of the most productive districts in the country, and is famous for its sheep and dairy products. Agriculture is the leading industry, wheat, barley and oats being the principal crops. Straw plaiting, lace making, paper making and chair manufacturing are also carried on. Buckingham is the county seat and Aylesburg is the chief commercial centre. Pop. (1921) 236,209. Consult Roscoe's *Buckinghamshire* (1918).

Buck'land, FRANCIS TREVELYAN (1826–80), English naturalist, was born in Oxford. After studying medicine for five years at St. George's Hospital, London, he was house surgeon there in 1852–3 and assistant surgeon to the 2nd Life Guards from 1854 to 1863, during which time he devoted himself to the study of zoology, and published his *Curiosities of Natural History* (1857–72). He was the highest authority of his day on pisciculture, especially on the artificial rearing of salmon; and in 1865 he promoted an exhibition of fisheries at South Kensington. He was inspector of salmon fisheries (1867), and special commissioner on the salmon fisheries in Scotland (1870). His published works include *Fish-hatching* (1863), *Natural History of British Fishes* (1881), and *Notes and Jottings from Animal Life* (1882).

Buckland, WILLIAM (1784–1856), English geologist, a native of Tiverton, succeeded Dr. Kidd as professor of mineralogy at Oxford in 1813, and in 1818 was presented to the readership in geology. About this time he began his geological collection, now at Oxford. In 1825 he was presented to the living of Stoke Charity, and in 1845 became dean of Westminster. He received the Copley medal of the Royal Society in 1822 for his account of the remains in Kirkdale Cave, which he more fully described in his *Reliquiæ Diluvianæ* (1823). Other important works are one of the Bridgewater Treatises, *Geology and Mineralogy Considered with Reference to Natural Theology,* and *A Description of the Southwest Coalfield of England* (1825).

Buckle, a metal devise for fastening straps or bands in garments, shoes, harnesses, etc. It consists of a rim, generally of iron, tin, or brass, or if for ornamental purposes, of gold or silver, with one or more movable tongues or catches. Shoe buckles were introduced into England during the reign of Charles II., and, as they became more and more the vogue, were made of costly materials and richly adorned with precious stones. Their popularity waned towards the end of the eighteenth century.

Buckle, HENRY THOMAS (1821–62), English historian and sociologist, was born in Lee, Kent, son of a London merchant. He was a delicate child and had little regular schooling, but acquired a liberal education at home. The death of his father in 1840 gave him an income of £1,500 a year, and he spent the next ten years in foreign travel, in the study of races and institutions, in learning languages, and in forming a library. In 1857 the first volume of his *History of Civilization in England* appeared, meeting with great success in both Europe and America. The second volume was published in 1861, but further progress was arrested by the death of the author at Damascus in the following year. The work is an attempt to give a scientific basis to history, by demonstrating the effect of natural conditions upon the progress of any race. Social progress is regarded as intellectual and not moral; a point of view which has been wholly superseded. It appears that the author had projected a huge work, of which these two volumes published formed but the introduction. Consult *Life* by Huth, and *Works,* edited by Miss Taylor, and by Grant Allen.

Buck'ley, JAMES MONROE (1836–1920), American clergyman and author, was born in Rahway, N. J. He studied at Wesleyan University, and prepared for the Methodist ministry at Exeter, N. H., joined the New Hampshire Methodist Episcopal Conference (1859), was transferred to Detroit (1864), and later to Brooklyn, N. Y. (1866). From 1880 to 1912 he was editor of the New York *Christian Advocate.* Some of his published works are *Two Weeks in the Yosemite Valley* (1873); *Supposed Miracles* (1875); *Christians and the Theatre* (1876); *Faith Healing, Christian Science and Kindred Phenomena* (1892); *Extemporaneous Oratory* (1899); *The Fundamentals and Their Contrasts* (1906); *Theory and Practice of Foreign Missions* (1911); *Constitutional and Parliamentary History of the Methodist Episcopal Church* (1912).

Buck'minster, JOSEPH STEVENS (1784–1812), American clergyman, was born in Portsmouth, N. H., son of a clergyman of that city. He was graduated from Harvard (1800), taught in Phillips Exeter Academy, and in 1804 became pastor of the Brattle Street Congregational Church, Boston. In 1811 he was appointed the first lecturer on Biblical criticism at Harvard (1811), but did not live to fulfil his duties. Buckminster left a remarkable reputation as a preacher and thinker, and was a predecessor of the group of Trinitarian Congregationalists who became Unitarians. A volume of his *Sermons*, with a memoir by Samuel C. Thacher, appeared in 1814, and his *Works* were published in 1839.

Buck'nell University, a Baptist coeducational institution of learning at Lewisburg, Pa., founded in 1846, and named in honor of a liberal contributor to its endowment funds. It includes a collegiate department, with engineering courses, and a school of music. For recent statistics see Table of Colleges and Universities under COLLEGE.

Buck'ner, SIMON BOLIVAR (1823–1914), American soldier, was born in Kentucky. He was graduated from West Point in 1844, was a professor there (1845–6, 1848–50), and in the Mexican War (1846–7) served as a second lieutenant under General Scott, winning the brevet of first lieutenant at Contreras and Churubusco and that of captain at Molino del Rey. In 1855 he resigned from the army, and at the outbreak of the Civil War, at which time he was in command of the State Guard of Kentucky, he joined the Confederate army, rising to the rank of lieutenant-general. At Fort Donelson he was third in rank on the Confederate side, and, after the escape of Generals Floyd and Pillow, his superiors, the surrender devolved on him, between 12,000 and 15,000 men and valuable munitions of war being turned over to General Grant. He subsequently took part in the battles of Stone River and Chickamauga. He was governor of Kentucky in 1887–91 and in 1896 was the candidate of the National Gold Democrats for the vice-presidency.

Buck'nill, SIR JOHN CHARLES (1817–97), English physician, was born in Market Bosworth, and studied medicine at University College, London. He began practice in Chelsea, but owing to ill-health removed to Exminster, to take charge of the Devon County Asylum (1844–62). He was elected fellow of University College, London (1850), and was the lord chancellor's medical visitor of lunatics from 1862 to 1876. He was knighted in 1894. Bucknill was the highest authority of his time on insanity; he wrote *Unsoundness of Mind in Relation to Criminal Acts* (1854), *The Psychology of Shakespeare* (1867), *Notes on American Asylums* (1876), *Habitual Drunkenness and Insane Drunkards* (1878), *A Manual of Psychological Medicine* (4th ed. 1879), etc. He edited the *Journal of Mental Science* (1855–62), and was one of the founders of *Brain, A Journal of Neurology* (1878).

Buckskin, a soft, pliable leather of a yellow or grey tint, prepared from the skin of a buck or sheep. It is used for gloves and shoes and was formerly employed by the Indians and early American colonists for clothing. The name is also applied to a strong twilled cloth with shorn pile, carefully finished, used for breeches.

Buck'stone, JOHN BALDWIN (1802–79), English actor and dramatist, was born in Hoxton, London. He was articled to a solicitor, but in 1820 abandoned law for the stage, and played at Peckham in melodrama. In 1823 he appeared in London in the Surrey Theatre as Ramsay in *The Fortunes of Nigel*, and in 1827 joined the company at the Adelphi, where he produced some of his best-known dramas. In 1833 he removed to the Haymarket, where he was manager from 1853 to 1876. He visited the United States in 1840. Buckstone was noted for his humor and pathos, and for his droll interpretation of comic characters. He wrote over a hundred dramas, the most popular being *Green Bushes*, *Flowers of the Forest*, and *Popping the Question*. His most famous rôles were Tony Lumpkin, Bob Acres, Sir Benjamin Backbite, and Scrub.

Bucks Stove Case. See BOYCOTT.

Bucktails, the name applied after 1812 to a faction of the Democratic-Republican Party in N. Y., identified with Tammany Hall, and opposed to De Witt Clinton and (after 1817) to the building of the Erie Canal. The faction gained the ascendency in the party about 1822, but lost it within two years; however, after Clinton's death (1828), it became the regular Democratic Party in the State. The name was derived from the insignia of Tammany—a buck's tail worn in the hat.

Buckthorn, a genus of hardy evergreen shrubs belonging to the order Rhamnaceæ, and including nearly 100 species found in all parts of the temperate zone. The Common Buckthorn, Waythorn, or Hartshorn (*R. cathartica*) is a spreading shrub, about ten feet in height, introduced into America from Europe. It has a smooth bark, branches terminating in thorns, small unisexual four-petalled green flowers, and four-seeded black berries about the size of currants. It is cultivated for hedges; the juice of the berries is sometimes used in medicine, as a purgative, and in the preparation of the color known as sap green; the bark furnishes a handsome yellow dye. Other species are the Alder Buckthorn (*R. frangula*), which also affords coloring matter; the Carolina Buckthorn or Indian Cherry (*R. caroliniana*), and *R. crocea*, which are generally larger than the European species; and *R. palinurus*, one of the plants which are said by tradition to have been used in Christ's crown of thorns.

Buckwheat (*Fagopyrum*), a cereal plant of the natural order *Polygonaceæ*, to which belong also the dock, sorrel, and rhubarb. There are three cultivated species, the Common Buckwheat (*F. esculentum*), the Notch-seeded Buckwheat (*F. emarginatum*), and the Tartary or Siberian Buckwheat (*F. tartaricum*). Buckwheat is an annual, is erect in habit, and generally grows to a height of about 3 feet. It has a long taproot with a stem one fourth to five eighths of an inch in thickness, varying in color from green to purplish red, changing to brown at maturity. The grain has a thick, hard, smooth hull, silver gray or brown in color. The flower is pink and fragrant and a favorite with bees.

Buckwheat thrives best in a moist, cool climate. It matures in from eight to ten weeks, and is well adapted to high altitudes and short seasons. It succeeds fairly well on soils too poor for other crops, but is not specially adapted to heavy clays or wet lands. Seed is sown from May to September or, in northern localities, from the middle of June to the middle of July, either in drills or broadcast. Three pecks of seed per acre is sufficient for good soil, but four or five pecks are necessary in poorer ground. Harvesting is begun soon after the first seeds are ripe. The varieties most commonly grown are the Common Gray, Silver Hull, and Japanese, the last being generally regarded as the best yielding variety. Barnyard manure or nitrogenous fertilizers are seldom profitable for buckwheat, but the use of lime and phosphoric acid is beneficial. Early plowing is desirable in order to allow the ground to settle before the seed is sown.

The buckwheat crop, while the least important of the six leading grain crops in the United States is nevertheless of considerable value as a source of food and is profitably grown for green manure, as a catch crop, and for the improvement of the mechanical condition of the soil. The grain contains 12.6 per cent. water, 10 per cent. protein, 2.2 per cent. fat, 64.5 per cent. nitrogen, 8.7 per cent. crude fibre, and 3 per cent. ash. It is used in the preparation of buckwheat flour, so largely employed in the United States for pancakes and griddle cakes, and of buckwheat farina and groats. Buckwheat is grown also as a bee plant, and is used as feed for pigs and for poultry; the middlings, the portion next to the hull, have a high food value and are fed to dairy cows.

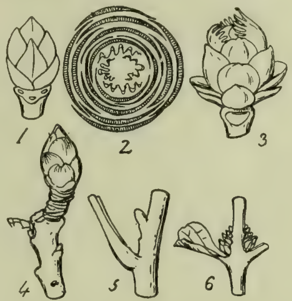
Buckwheat is remarkably free from plant diseases and insect pests. It has no definite place in crop rotation but is largely grown as a substitute for spring-planted crops that have failed. In 1921 the United States production was 14,079,000 bushels, valued at $11,438,000. The leading States were Pennsylvania and New York, with Wisconsin, Michigan, West Virginia, Minnesota, and Ohio following, but far behind.

Bucy′rus, Ohio, county seat of Crawford county, on the Sandusky River, and on the Pennsylvania, and the Toledo and Ohio Railroads; 69 miles southeast of Toledo. Electric lines connect with Columbus and Cleveland. Manufactures include cranes, machine tools, hog rings, copper kettles, steel products, tires and tubes, tractors, lumber products, clothing, cigars, dairy products, and soft drinks. Pop. (1900) 6,560; (1910) 8,122; (1920) 10,425.

Buczacz, bo͞o′chäch, town, Galicia, on the Stripa, an affluent of the Dneister; 47 miles northeast of Stanislau. Agriculture is the chief industry; there are also tanneries and manufactures of potash. Pop. 13,000.

Bud. A bud is an unexpanded branch—stem, leaves, and sometimes flowers being all present in a miniature and undeveloped form. This branch is formed in advance, so that, when spring and sunshine arrive, no time is lost in pushing ahead and effecting growth before winter again arrives and checks activity. In some cases, by the efforts of art or nature, the bud, while growing in size, never really develops. We see this in the cabbage head, which is in reality a large bud.

As buds have often to live through severe weather, with excessive cold and wet, their parts are packed tightly together, so that the minimum of surface may meet the outer world; they are usually covered by certain scales, which are modified leaf-bases, stipules, or leaves. The buds of evergreens have usually no protecting scales. Often additional protection is afforded by means of hairs or resin; and many plants which die down every year have their buds waiting beneath the earth's surface until the sun's warmth tempts them to push forth and develop into the stems, leaves, and flowers that they really are. Certain aquatic plants (as the bladder-worts) at the approach of winter form spherical buds, which are drawn down to the bottom until spring, when they elongate, and rise to the surface, to expand into branched, floating plants. Buds usually arise in the axils of leaves, though circumstances may cause them to form elsewhere. The so-called fruit-buds of apple and pear trees may usually be distinguished from those buds which will yield stems and leaves only, by their greater size, and by their being commonly situated at the end of a stem or spur.



Buds.

1, 2. Acer and section. 3. Horse chestnut. 4. Pear flower-buds. 5. Walnut, extra axillary buds. 6. Honeysuckle, clustered.

Budæus, bū-dē′*us*, or Budé, Guillaume (1467–1540), French philologist, was born in Paris. After a somewhat reckless youth, he became one of the most profound Greek scholars of his day. His most remarkable works are *De Asse* (1514), a treatise on ancient Greek and Latin coins and measures, and *Commentarii Linguæ Græcæ* (1529; improved ed. 1548). His collected works were published at Basel (1557). He was highly esteemed by Francis I.

Budapest, bo͞o′dä-pest, capital and chief city of Hungary, is situated on the Danube; 163 miles southeast of Vienna. It consists of the two cities of Buda and Pest on opposite banks of the river, together with Obuda (Altofen) and Köránya, which in 1872 were united into the one municipality. Six bridges, three of which are of the suspension type, cross the Danube here.

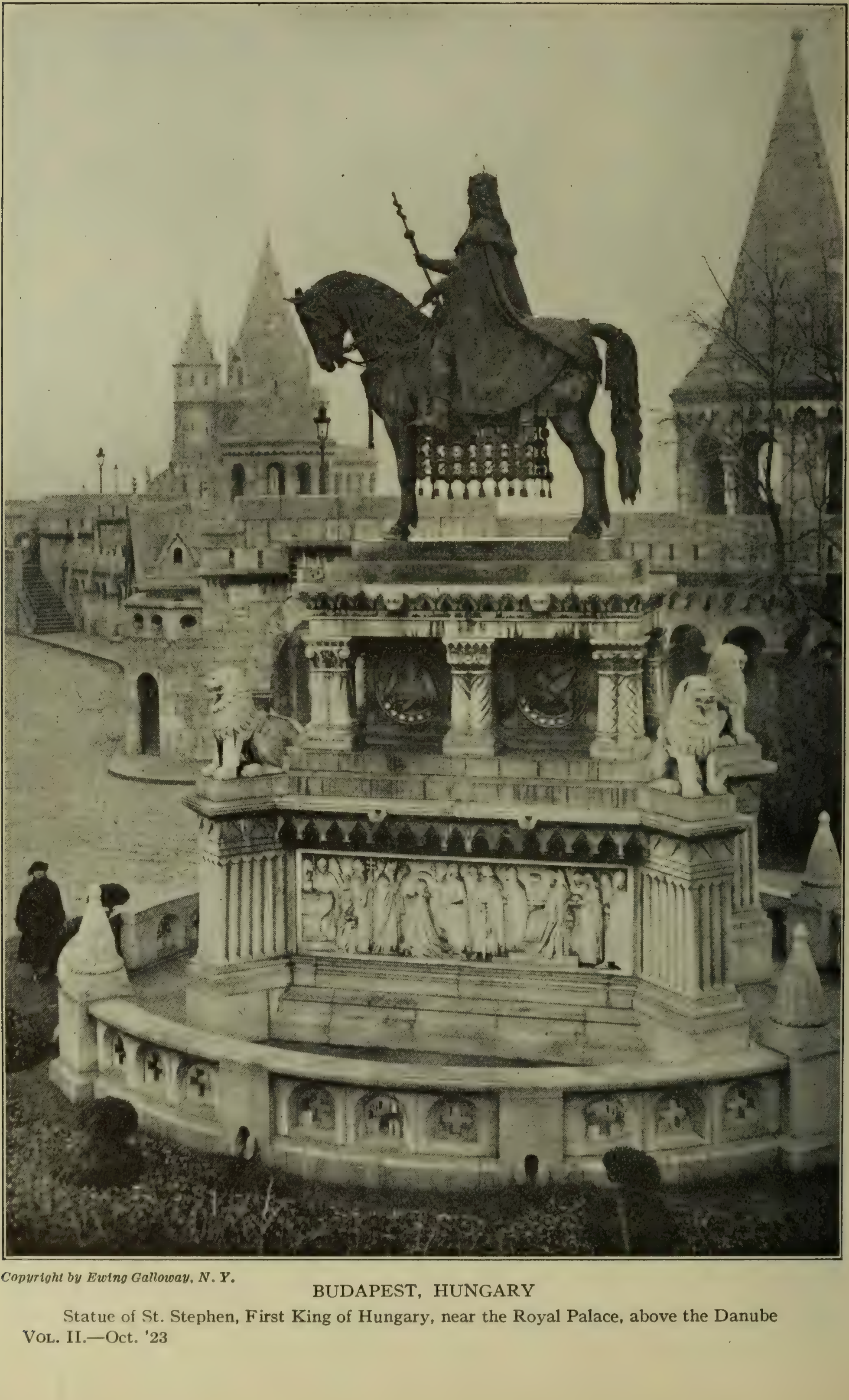
Buda, on the west side of the river, is the older part of the city. It occupies the heights overlooking the Danube and contains the old fortress crowning the summit of a high hill; the royal palace, erected by Maria Theresa in 1749–71 and greatly enlarged in 1894–1906; the Matthias Church completed in the 15th century; and the Fisher-Bastion containing a bronze statue of St. Stephen. Buda has many famous hot sulphur springs, around which luxurious bathing establishments have been established; among these are the Rudas Fürdö, the Racz Fürdö, the Elizabeth Saline Bath, and the Hunyadi-Janos mineral springs.

Pest, on the east bank of the river, is the finest and most important part of the city. Its centre is the quarter *Belváros* or the 'inner city,' beside the Danube, enclosed within a boulevard which has replaced the old city walls. From this boulevard the streets radiate to the northeast and southeast, the finest being the Andrássy Street, the Kerepesi, and the Ullöi. Along the Danube the Francis Joseph quay stretches for a mile between the Francis Joseph Bridge and the Margaret Bridge. Near its northern end imposing new Houses of Parliament were completed in 1903, and in the same vicinity are the Curia Regia and the Law Courts. Other noteworthy institutions and buildings are the University, the Academy of Sciences, the Museum of Fine Arts, the National Museum, the Industrial Art Museum, the Opera House, the Bourse, the Leopoldstadt Basilica, St. Stephen's Church, the Ráth Museum, Stefanie Hospital for Children, and the Josephicurm Orphanage. The botanical, public, and Orczy gardens and Margaret Island, once the seat of a convent, offer pleasant recreation grounds.

The chief industries include engineering, flour milling, carriage building, printing, shipbuilding, brewing, distilling, and the manufacture of tobacco, glass, chemicals, and fancy and leather goods. There is a good trade in grain and wine. The city is the centre of the Hungarian railway system, and has excellent street-railway facilities.

In 1921 the population was 1,184,616. In 1881 it was but 370,767, of which four-fifths was in Pest. A large percentage of the inhabitants are Roman Catholics, and there are many Jews.

Buda, or Ofen, originated in the Roman military colony of Aquincum, and was the capital of Lower Pannonia. Destroyed by the Mongols in 1241, it was rebuilt by Bela IV., and from 1351 to its conquest by the Turks in 1526 it was the residence of the kings of Hungary. While in Turkish hands, the city was six times besieged by the imperialist forces, who took it in 1686. The Hungarians stormed it in



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BUDAPEST, HUNGARY

Statue of St. Stephen, First King of Hungary, near the Royal Palace, above the Danube

1849. Pest existed from Roman times, but was not of much consequence till the 18th century. In 1867 it was made the capital of Hungary. From the 10th to the 14th century the Hungarian national assemblies used to meet in the open air on the Rákos plain, east of the city.

Budaun, or BUDAON, tn. in Rohilkhand div., United Provs., India. Founded, according to tradition, by Budh, an Ahar prince, about 905 A.D., it was a centre of disturbance during the mutiny of 1857. Pop. (1901) 39,031. The district of Budaun is a level fertile tract with an area of 1,990 sq. m. Pop. (1901) 1,025,753.

Colossal Statue of Buddha at Kamakura, Japan.

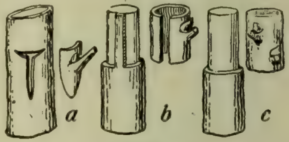
Buddha, 'The Enlightened One,' was the founder of Buddhism. His father, Suddhodana, was the chief of a small Aryan tribe named the Sakyas, whose capital, Kapila-vastu, was situated about 100 m. N.E. of Benares. As a child he received the name of Gautama. He is also known as Siddhartha and as Sakyamuni, and lived from about 560 to 480 B.C. Miraculous circumstances are alleged to have attended the conception and birth of Gautama, and many legends are preserved of the wisdom and prowess which marked his childhood and youth. It was not until his twenty-ninth year that Gautama saw the visions which led him to devote himself to the study of religion and philosophy. Paternal promptings which followed the birth of a son threatening to interfere with the divine call, Gautama, in a pathetic parting from his sleeping wife and babe, completed his great act of renunciation—leaving family and friends, wealth and power, to become a penniless and despised student and homeless wanderer. It is impossible, within the scope of this article, to follow Gautama in his wanderings and in his efforts to 'acquire merit.' Repeatedly tempted to return to the comforts of his home, assailed by doubts as to the reality of that virtue for which he had sacrificed so much, deserted by his followers, overwhelmed by the bitterness of failure, it was long ere, brooding in silent solitude under the bo-tree (tree of wisdom), there dawned the kindly light which enabled him triumphantly to exclaim, 'I know it all.' Henceforth he was the Buddha. On his return home his wife embraced his feet, and widowed herself in becoming one of the first Buddhist nuns. His son and his half-brother joined the order of pious mendicants which he established. Buddha received his religious instruction from Brahmans, and his mission was the reformation of Hinduism. In withstanding the corruption and sensuality of his age, his broad philanthropy opened a heaven to the meanest outcast; and although he was thus placed in an attitude of passive antagonism to the distinctions of caste, he continued a devout Hindu. In spite of the inherent weakness of the creed he promulgated—its end contemplation, inertia, Nirvána—there is much that is fascinating in Buddha's devotion to duty, and in the example of a lifelong sacrifice which sought no selfish or sordid end. For a beautiful poetic rendering of Buddha's life and work, see Edwin Arnold's *Light of Asia* (1900).

Buddh Gaya, or BODH GAYA, vil., Gaya dist., Bengal, India; situated 6 m. S.W. of Gaya town. It is said to have been the dwelling-place of the founder of Buddhism, and has interesting Buddhist remains, including the palace of Asoka, the great Buddhist emperor.

Buddhism. The Buddhist scriptures do not contain a life of the founder. He was born in the 6th cent. B.C., the age of Zoroaster, Thales, the second Isaiah, Lao Tsze and Confucius. His father was a king in what is now Nepal. At the age of twenty-nine he became an ascetic, and after long search discovered a new 'way' of salvation. The faith which he then promulgated was Buddhism. In its inception Buddhism was a reformation and a protest against Brahmanism, which had run to seed in a tangle of philosophy and ritual; the arrogance of the priesthood and the injustice of caste were crying evils when Buddha preached his broad philanthropy. Making no attempt to solve the problem of the origin of things, he proclaimed the equality and brotherhood of man, and that the great end and object of existence was to attain extinction of personality (*Nirvána*) by self-sacrifice, contemplation, and suppression of all passion. Subtly mingled with this inertia was the doctrine of *Karma.* This was a remodeling of the doctrine of transmigration on the basis of his psychology. Buddhism recognizes no soul, and therefore no future corporeal existence of any individual; but each human act, right or wrong, each thought, pure or impure, is not only irrevocable but irredeemable. After death these actions (or results of actions) and thoughts (or their results), good or evil, have an existence in a new being in whom are combined the effects of the actions of the former being whose heir and successor he is. The basal assumption of Buddhism is that individual existence is an evil, the object of striving is therefore to attain Nirvána. Innumerable 'precepts' and 'paths' of duty and of holiness point the 'way' by which each human being is to work out his salvation. By temperance, chastity, kindness, brotherly love, the body and the senses are brought under subjection, until being is absorbed in blissful *Nirvána.* The life of an insect is as precious as that of a man; therefore to kill the humblest creature is accounted murder. Theft, deception, insobriety are denounced. Marriage is discouraged, but incontinence and unchastity are condemned. The encouragement of celibacy led to the formation of monastic orders, male and female. These monks and nuns were addressed by the Buddha as 'mendicants.' In process of time the monasteries became the repositories of learning, and thus gradually, almost imperceptibly, the priestly supremacy and arrogance which Buddha exerted himself to overthrow were once more reestablished.

The Buddha wrote nothing. It was at least one hundred and thirty years after his death, when the Emperor Asoka—the Constantine of Buddhism—assembled a council of monks, that the first attempt was made to reduce the teachings of Buddhism to writing. Subsequent councils sought to amplify its doctrines and to explain difficulties, but each attempt to reduce to dogma the precepts of the great teacher raised fresh doubts and further objections. Astute Brahmans, quick to mark evidence of decay in the voice of dissent, at once adopted Buddha as an incarnation of Vishnu, and by concessions and adaptations enticed dissenters back into the fold of Hinduism. Thus was Buddhism driven from its birthplace, and at the present day it has almost ceased to exist in India. There are many passages of remarkable and poetic beauty to be found in Buddhist scripture, but the apparent hopelessness of the creed makes small appeal to the more sanguine and robust Western mind. This 'knowledge of the way'—a religion without theology, without deity, and with no gorgeous ritual—was spread by mendicant missionaries, northwards over Nepal and Tibet, eastwards through Burma and China to far-away Japan, and over Ceylon in the south. To-day it is the acknowledged faith of probably five hundred millions of the inhabitants of the world. In its diffusion it has lost some of its characteristics, and it has been absorbed in other and even antagonistic faiths. The Lamaism of isolated Tibet is far removed from the religion of progressive Japan; deep gulfs separate the Burman, the Chinaman, and the Ceylonese; yet all reverence the benign Buddha. For a popular treatise, see T. W. Rhys Davids's *Buddhism* (1877; new ed. 1894), and his American Lectures with the same title (New York, 1896), in which all the leading authorities are given; Lillie's *Buddha and Buddhism* (1900); also Grünwedel's *Mythologie des Buddhismus* (1901).

Budding. The process of budding consists in taking from the tree which it is desired to propagate a piece of the bark with bud attached, and inserting it beneath the bark and against the wood of the tree which is to serve as parent or stock. The process is chiefly employed in the propagation of peaches, but it is also much used for propagating plums, pears, and apples, and occasionally for multiplying choice varieties of maples and other ornamental trees. July, August and September, are the months usually chosen for performing the operation, and it is very desirable that the bark should slip readily from the subjacent wood. Where possible, the stock for fruit-tree buds should be not less than an inch in circumference, and the bud should be inserted a very few inches above the ground-level, the leaves of the stock being rubbed off for two inches on either side just previous to the operation. Everything being in readiness, a vertical incision an inch or more long is made with a sharp budding knife just through the bark of the stock, and a horizontal incision of half an inch across its highest point—the two cuts forming a T. A well-ripened shoot of the current season's growth is next cut from the variety which it is desired to increase, and its leaves cut off, leaving a small piece of each leaf-stalk attached to the stem. The best buds are situated at the lower and older part of the stem. By a careful use of the knife, the bud, together with half an inch of bark above and below is cut out—the smallest thickness of wood remaining attached to the base of the bud. Should there be no wood, but a hollow opposite to the bud, then the bud is useless. If, on the other hand, there is much thickness of wood left attached, the harder part of it should be carefully cut away. The whole bud and bark ought to be shield-shaped, widest in the middle where the bud is situated, and tapering to a point above and below. The bark of the stock must next be carefully loosened from the wood by means of the handle of the budding-knife, and the bud inserted in the cleft so that its inner surface presses against the surface of the bared wood of the stock. The whole must then be closed and carefully bandaged over, above and below the bud, with raffia or some other soft string like waxed cotton strips or yarn. The tying material, which must be applied securely, but not too tightly, should completely cover the bark of the scion and the wound of the stock—only the bud itself projecting uncovered. In three weeks the tying material should be removed. The following spring, if the budding has been successful, the stock should be cut off immediately about the bud, so that all the energy may be concentrated in its development. For further information, see L. H. Bailey's *The Nursery Book* (1895); Batlet's *Grafting and Budding.*



Budding.
a, Shield budding; *b*, *c*, ring budding.

Budge, Ernest A. Wallis, English Egyptologist, studied at Cambridge, where he was a distinguished Oriental scholar. He has conducted excavations at Assouan in Egypt, at Jebel Barkal in the Sudan, and at Nineveh and Der in Mesopotamia, and became keeper of Egyptian and Assyrian antiquities in the British Museum. Among his numerous works are *Life and Exploits of Alexander the Great* (1896); *Guide to Babylonian and Assyrian Antiquities in the British Museum* (new ed. 1908); *Book of the Dead* (1901); *History of Ancient Egypt* (8 vols. 1902); *Egyptian Sudan, Its History and Monuments* (2 vols. 1907); *Guide to Egyptian Collections in British Museum* (1908); *Legends of the Gods and Annals of Nubian Kings* (1911); *Osiris and the Egyptian Resurrection* (2 vols. 1911); *Rosetta Stone* (1913); *Short History of the EgyptianPeople* (1914); *Miscellaneous Coptic Texts in the Dialect of Upper Egypt* (1915); also several works on the texts and inscriptions of ancient Egypt, Assyria, and Babylonia.

Budgell, EUSTACE (1686–1737), English essayist, was born near Exeter. He acted as under secretary to his cousin, Joseph Addison, when the latter was lord-lieutenant of Ireland and was associated with Addison and Steele in writing *The Tatler.* He contributed to *The Spectator* and *The Guardian,* and from 1733 to 1735 published a weekly periodical, *The Bee.* In 1717 Budgell was made Accountant and Comptroller-General of the Revenue in Ireland, but was removed for a lampoon directed against the lord-lieutenant's secretary. He subsequently met with large financial losses in the South Sea scheme, was accused of various irregular transactions in connection with the will of Matthew Tindal, and eventually drowned himself.

Budgerigar, buj′ėr-i-gär′, a dealers' name for the zebra grass-parrakeet (*Melopsittacus undulatus* of Australia). It is a small bird, about seven inches long, in color a yellowish green striped with black, and having two blue tail feathers. Its natural voice is soft and musical and it makes an attractive cage bird. America and England import large numbers of these birds. See PARRAKEET.

Budget, Family, or INDIVIDUAL, a detailed plan for the expenditure of the family or personal income. *The Cost of Living,* published in 1899, by Ellen H. Richards, with a discussion of the family budget was the first work in the United States to call attention to this matter in any effective way. About 1919, the subject began to be widely discussed, and after the opening of the European war in 1914 increasing attention was given to the necessity for such a plan and for the checking of the plan by the keeping of detailed classified accounts.

Many statistics have been gathered giving the expenditure of selected families (usually those of low or very moderate income), classified under a few general headings. These figures have been much used by bodies considering the minimum wage, or the lowest possible cost of living decently, for family or individual. In addition there have been issued many so-called 'ideal' budgets, in the attempt to help those who are making such a definite plan for the first time. These have been issued by government agencies, educational institutions, banks, and individuals. Such 'ideal' budgets generally give the percentages of expenditure for a fairly good income as follows:

	Per cent
Food	25
Rent	20
Operating Expenses (of house)	15
Clothing	20
Other Expenses, including Savings	20

This last heading is often called Higher Life, or Advancement, although it must include many expenditures that do not seem to the ordinary man or woman to belong under such a title.

As Dr. Engel pointed out long ago, in his 'laws,' there are certain proportions of family expenditure that seem to remain constant as the income changes, while others vary widely. The Engel 'laws' briefly stated are: First, the higher the income, the lower the percentage of the cost of subsistence (bare necessities) —in the lowest incomes food has to have a very large proportion. Second, the percentage for clothing remains the same for all incomes. Third, the percentage for housing (rent plus fuel plus lighting) also remains the same. Fourth, as the income increases, the percentage available for the higher needs grows larger.

It is being increasingly recognized that for those who have more than enough money for the bare necessities of life, wide latitude of choice in the expenditure of the extra amount is not only allowable, but socially desirable, and that what should decide many of the items of a particular budget is not what someone else thinks the family ought to have, but what they themselves deliberately decide that they wish. A larger number of headings than that given above is now general. 'Food and clothing' are often subdivided, 'savings' is always given a separate heading, and many other items are taken out of the general headings. The use of 'Miscellaneous, Sundries, or Incidentals' as a heading has proved dangerous, because difficult to plan for or control, and in the best lists no such heading is used.

A number of books have been published discussing the subject of the family budget, some of which are named below. There are also a large number of budget and account forms printed, to be used in carrying out such a plan. The movement for the budget has been approved and encouraged by the savings banks of the country, since it is the universal testimony that where the budget and accounts habit is established, savings increase. Some banks have a department for advising individuals how to make their own or their family budget, and to keep the right accounts, the head of the department being a woman who has specialized in this subject.

Since the expenditure of the largest proportion of the family income is usually in the hands of the woman who presides over the home, it is women who ask most for such advice; but the importance of having all members of the family accept early the principle of the budget and establish its practice is being recognized in the training, in school, of girls and sometimes of boys in the budget and account habit for their own personal expenditure. Emphasis on the co-operative aspect of family life leads to a new attitude as to the relation of all members of the family to the apportionment and use of the family income.

The period for which the budget is made is usually a short one for dependent families or those living on a very narrow margin of expenditure. For the ordinary family the budget period must be longer, since some expenses are not evenly distributed. Insurance, for example, may be paid only once or twice a year. Clothing necessitates heavy expenditure in one month and none in another. A year is generally accepted as the right length for the budget period for such families, with readjustment of the items within that period if the necessity arises.

The accounting side is one of great importance, as the budget must be checked by accounts kept under the same headings as those under which money is assigned in the budget. The accounts must be such that they answer the questions that the family or individual may wish to ask, without being so great a burden tha they will be neglected or dropped. Household accounts are not bookkeeping in the business sense. The books noted discuss this subject fully. The extension of the money resources by conserving what is bought and by using the labor income of the family are being stressed more than ever before.

With the adoption of the budget plan goes, naturally, careful study of the best use of the money assigned to each heading, so that the greatest value possible may be had for the money expended. In 1899 Mrs. Richards judged that American families were using most unwisely the money spent for food and for operating expenses. Since that time clothing and amusement have in many instances come to the front as the chief offenders; but these generalizations do not necessarily help any one family or any one individual, since each has its or his or her own problems to meet.

Of the following books, the first two give directions for making a budget and keeping accounts, the last two the general principles of the subject without detailed directions: Taber's *The Business of the Household* (1918); Lord's *Getting Your Money's Worth* (1922); Richards' *The Cost of Living;* Abel's *Successful Family Life on a Moderate Income* (1921).

Budget, Governmental. In a general sense, a budget is a periodical financial document forecasting revenues and expenditures of an enterprise or government during a certain determined period of time, it being also an authorization or an order by competent authorities to collect the designated revenues and to make the designated expenditures. Such documents generally present a report of receipts and expenditures during the fiscal period just closed and the manner in which revenues and expenditures are balanced, together with an estimate of the receipts and expenditures for the future period. Such preliminary plan is the basis for the enactment of the required financial legislation.

United States.—In the United States there was no Federal budget system until 1922, though the subject had been agitated for more than a decade prior to that time. In 1912 President Taft's non-partisan Commission on Economy and Efficiency recommended to Congress the adoption of a responsible budget system; a number of budget bills were subsequently introduced into Congress, and in 1920 the Good Bill was passed by both House and Senate but was vetoed by President Wilson (June 4, 1920). The bill was reintroduced into Congress on April 25, 1921, and was passed on May 5, 1921. In the meantime the McCormick Budget Bill was adopted in the Senate. Differences having been settled in Conference, the final bill, known as the McCormick-Good Budget Bill, was approved by President Harding, June 10, 1921, and Charles G. Dawes was appointed first Director of the Budget.

This act authorizes the President to transmit to Congress, on the first day of each regular session, the budget containing an estimate of the expenditures and appropriations necessary for the support of the government during the ensuing fiscal year; estimates of the receipts for the same period; a summary of the expenditures and receipts of the previous fiscal year; estimates of expenditures and receipts of the fiscal year in progress; the amount of appropriations available for expenditure during the fiscal year in progress; statements of the condition of the treasury at the end of the previous year, the estimated condition at the end of the year in progress, and at the end of the ensuing fiscal year; and facts regarding the indebtedness of the government.

The act creates within the Treasury Department a Bureau of the Budget, in charge of a Director and Assistant Director, appointed by the President. The chief duty of this Bureau is to prepare the budget and to this end it is empowered to revise, reduce, or increase the estimates of the several departments, prepared by the budget officer of each department, which officer is established by the act. The Bureau of the Budget must also make a detailed study of the various departments and make a report to the President, that he may decide what changes are necessary in their organization for efficiency and economy.

The first budget submitted under the new law was for the years 1922 and 1923. It is given on page 363.

The earlier arguments in favor of a budget system made a strong appeal to the country and so gained in favor that by 1912 Massachusetts and New Jersey appointed commissions to inquire into methods for securing greater economy in conducting State business. The next year New York, Pennsylvania, Minnesota, California, Illinois, and Iowa appointed similar commissions. Thus has the work continued so that in 1921 forty-six of the forty-eight States had enacted or had pending constitutional or statutory measures on the subject.

There have been established three general types of State budgets—executive, legislative, and commission. In the *executive type*, the governor is responsible for giving an account of the acts of the administration involving the raising and spending of State money and the preparation of an estimate and plan of administration for a future period for which an appropriation is asked. The said account and plan are the subject of inquiry and action of the legislative body. Oregon and Ohio established this system in 1913; Iowa, Minnesota, and Nebraska in 1915; Maryland and New Jersey in 1916; Delaware, Illinois, Kansas, New Mexico, and Utah in 1917; Massachusetts, Mississippi and Virginia in 1918; Arizona, Colorado, Idaho, Indiana, Nevada, New Hampshire, Oklahoma, South Carolina, and Wyoming in 1919.

In the *legislative type* the preparation of estimates and plan of administration for the financing of a future period are made up by the legislature through its committees or agents, the administrative officers acting only in an advisory capacity. Arkansas adopted this type in 1913 and New York in 1916. The *commission type* provides for a commission which may be composed of executive and administrative officers or appointees of the governer, or, in other instances, may be part *ex officio*, with other members appointed by either the executive or legislative powers. This commission reviews the acts of the administration involving the raising and spending of money, and prepares estimates for the financing of a future period which are submitted to the legislature for inquiry, deliberation, and action. This type of State budget was adopted by California and Wisconsin in 1911, by Connecticut, Washington, North Dakota, and Vermont in 1915, by Louisiana in 1916, by Tennessee and South Dakota in 1917, by Kentucky, West Virginia, and Georgia in 1918, by Alabama, Montana, Michigan, Texas, Maine, and North Carolina in 1919, and by Florida and Missouri in 1921.

Until the last two decades municipal budgets, if so they may be called, have been prepared in the same manner as in the State and Federal governments—that is by committees of Council or of the Board of Aldermen—and were finally enacted into financial measures by those municipal legislative bodies. A few of the larger cities of the United States have other methods adopted in accordance with their charters. In New York City a Board of Estimate and Apportionment

UNITED STATES BUDGET 1922 AND 1923.

(The first Budget of the United States made up by Director Charles G. Dawes and submitted to Congress on Dec. 5, 1921.)

BUDGET SUMMARY.

(Exclusive of postal revenues and postal expenditures paid from postal revenues.)

	1923. Estimated.	1922, Estimated.	1921, Actual.
Total receipts	$3,338,182,750	$3,943,453,663	$5,624,932,960.91
Total expenditures, including reduction in principal of public debt	3,505,754,727	3,967,922,366	5,538,040,689.30
Excess of expenditures	$167,571,977	$24,468,703	
Excess of receipts			$86,892,271.61

The White House, Dec. 5, 1921.

WARREN G. HARDING.

ESTIMATED EXPENDITURES FOR 1922 AND 1923.

	Estimated Budget Expenditures, 1923.	Estimated Expenditures, 1922.	Actual Expenditures, 1921.
Legislative	$16,265,215	$15,984,446	$18,994,565.17
Executive Office	227,045	227,045	197,341.68
State Department	10,432,624	11,406,032	8,780,796.84
Treasury Department	168,997,160	169,871,163	476,352,192.21
War Department	369,902,107	389,091,406	1,101,615,013.32
Panama Canal	7,358,839	7,219,849	16,461,409.47
Navy Department	431,754,000	478,850,000	650,373,835.58
Interior Department	41,799,022	35,005,829	39,687,094.86
Indian Service	31,883,000	33,135,000	41,470,807.60
Pensions	252,350,000	258,400,000	260,611,416.13
Post Office Department	3,357,092	3,276,454	5,230,650.15
Deficiencies in postal revenues	21,509,666	48,172,270	130,128,458.02
Department of Agriculture	47,497,530	48,637,100	62,385,702.93
Expenditures for good roads	*125,700,000	*105,000,000	57,452,056.48
Department of Commerce	19,939,970	20,131,800	30,828,761.55
Department of Labor	6,301,835	4,796,916	8,502,509.55
Department of Justice and Judicial	18,415,681	16,825,568	17,206,418.03
Shipping Board and Fleet Corporation	50,495,735	73,911.081	130,723,268.26
United States Veterans' Bureau	455,232,702	438,122,400	
Railroad Administration and Transportation Act		337,679,235	730,711,669.98
Federal Board for Vocational Education	5,529,244	4,756,344	104,671,772.62
Other independent offices, including War Finance & Grain Corporations	17,034,583	16,983,165	83,596,418.52
District of Columbia	25,070,877	22,275,063	22,558,264.16
Increase of compensation		35,000,000	
Purchase of obligations of foreign Governments			73,896,697.44
Purchase of farm loan bonds			16,781,320.79
Deduct unclassified repayments, etc			922,593.14
Ordinary expenditures	$2,127,053,927	$2,574,758,166	$4,088,295,848.20
Reduction in principal of the public debt:			
Sinking fund	$283,838,800	$272,442,200	$261,100,250.00
Purchase of Liberty Bonds from foreign repayments	30,500,000	30,500,000	73,939,300.00
Redemption of bonds and notes from estate taxes	25,000,000	25,000,000	26,348,950.00
Redemption of securities from Federal Reserve Bank franchise tax receipts	30,000,000	60,000,000	60,724,500.00
Total net reduction in principal of public debt	$369,338,800	$387,942,200	$422,113,000.00
Investments of trust funds:			
Government life insurance fund	$26,162,000	$22,022,000	$20,325,152.88
Civil Service retirement fund and D. of C. teachers' retirement fund	8,200,000	8,200,000	8,161,956.87
Trust fund investments	$34,362,000	$30,222,000	$28,487,109.75
Interest on the public debt	$975,000,000	$975,000,000	$999,144,731.35
Total expenditures	$3,505,754,727	$3,967,922,366	$5,538,040,689.30

* The above table includes estimates of additional expenditures during 1923 and 1922 for good roads, authorized by the act of Nov. 9, 1921.

Excess of estimated expenditures over ordinary receipts, fiscal year, 1923	$167,571,977.00
Excess of estimated expenditures over ordinary receipts, fiscal year, 1922	24,468,703.00
Excess of ordinary receipts over expenditures payable therefrom, fiscal year, 1921	86,892,271.61

was established in 1871, composed of the mayor, president of the Board of Aldermen, and the five borough presidents, to draw up annually a scale of estimates and the apportionment of appropriations for the conduct of the city's business. Their estimates are submitted to the Board of Aldermen for legislative enactment under certain fixed limitations. Baltimore also has a Board of Estimates performing somewhat the same duties in a like mammer. The Board of Estimates in Detroit, Mich., is composed of two members from each ward and five at large who are chosen by the electorate. This body passes upon the appropriation measures after these have been enacted by the city councils. In Philadelphia the City Comptroller is the only officer who submits the estimates to the City Councils, where they are received, revised, amended, and prepared as legislative ordinances by a finance committee of that body. The mayor of Cleveland, Ohio, performs a budget function, similar to that of the comptroller in Philadelphia.

Only with the extensive adoption of the commission and city-manager forms of municipal government during the last two decades, has municipal budget making received any great attention. In the commission and city-manager governed municipalities, the budgets of estimated annual expenditures are usually prepared by the finance member or manager and submitted to the whole commission for deliberation and action. It is rare in American municipal budget making to include a statement of estimated revenues and a public balance sheet. Revenues, being principally derived from taxation, are generally made to conform to the estimated fiscal requirements of the municipality, as expressed in the budget.

In recent years efforts have been made to establish a budget system in the administration of county financial affairs. Examples of such applications are now in operation in Los Angeles county, Cal., and in Westchester, Ontario, and Monroe counties, New York.

England has the most efficiently developed responsible budget system of all civilized nations. The principal political officer of the Treasury is the Chancellor of the Exchequer, who receives all the estimates of the civil departments of the government. He then reviews and compares these estimates with the expenditures of previous years, also revising, correlating, and reducing these estimates to the necessary minimum figures for the running expenses for the efficient administration of the departments for the following fiscal year. He also estimates the revenues for the coming year on the basis of existing taxes, which he balances with the estimated expenditures, and if the latter exceed the former he draws up proposals for new taxation. Increases or decreases in revenue are an essential part of the budget. These estimates and proposals are presented, together with the estimates of the War Office and the Admiralty, which must first have received the Treasury approval, to the Cabinet, which finally approves the whole financial policy.

The approved estimate, which includes an itemized account of the proposed government expenditures, where and how the revenues will be raised to meet the same, a comparison in parallel columns of the expenditures and revenues of the current year, together with a balance sheet of past and proposed public finances, is presented by the Chancellor of the Exchequer to the House of Commons at the opening of its annual session. The House considers the budget item by item, while sitting as a committee of the whole, and, while there is much debate, yet rarely are changes made in the Budget Bill, as the Commons has no right to increase or shift any items of the estimate nor to make any decreases except with the consent of the Cabinet. The House of Lords is required only to give a formal assent to the measure. The estimates, together with the Finance Bill and the Appropriation Bill, are generally passed by the House as they are introduced, but the government is held to a strict accountability both for the efficiency and economy of its service and the regularity of its accounts.

The main feature of parliamentary control in the British budget system is through the audit of the Comptroller and Auditor-General, an independent parliamentary officer appointed for life. The audit-report of this officer reveals any and all irregularities in the accounts—such as loss, waste, fraud, extravagance or incompetence—that may appear in comparison of the accounts with original grants. This report is sunmitted to the Public Accounts Committee of the House of Commons, a standing committee of fifteen members, the chairman of which is a member of the Opposition, whose statutory duty is the securing of parliamentary control of the budget. The committee examines the points raised by the Auditor-General relative to the appropriation accounts, holds investigations and public hearings on irregularities, and even refuses to sanction the payment of money until irregularities are explained to its satisfaction. It makes detailed reports to Parliament.

The budgets of English municipal and local governments are usually prepared by the finance committee of the town council. This committee is held to strict account for all financial affairs of the government but the several committees are responsible for the expenditures within their jurisdiction. The manner of laying the rates (taxes) varies in different cities.

The ***British dominions*** having separate local autonomy—Canada, Australia, New Zealand, South Africa, and India—have established budgets in which are incorporated many of the main features of the home system.

France.—In the preparation of the French budget responsibility is scattered throughout the Ministry and in the legislative branch of the government, but at all times the budget is considered as a unit. Each minister is responsible for the estimates of his department, which he submits to the Minister of Finance, who organizes these estimates into a whole without the power of revision. The finance minister also devises the means of raising sufficient revenue to meet the expenditures of the budget. In fact, he draws up the whole budget bill, which is submitted as a project of law to the Chamber of Deputies, who refer it to the Budget Committee. This committee meets in closed session and has power to increase, reduce, or eliminate items, add new items, rewrite the budget bill, or reject it completely and return it to the minister, demanding that he write a new bill, thus causing a constant struggle between the members of the ministry and the committee. The committee reports the bill to the Chamber for debate, where the members amend the bill with the restriction that no item can be increased nor new items added relative to salaries, pensions, etc. After the expenditure and revenue proposals of the budget are debated and passed chapter by chapter, the entire budget is formally adopted as a whole. The bill is then taken to the Senate, who have the power to restore items eliminated by the Chamber and to reduce or eliminate any of the items. Debate and passage are similar to those of the lower house. Following the Senate action the bill is returned to the Chamber for the consideration of the Senate amendments. This process may be followed several times before an agreement is finally reached. If the bill fails of passage in the Assembly, the ministry resigns and a new one is formed which will control a majority in the Chamber.

In France control of expenditures is by three processes. First, there is an executive control through the departmental boards of control who make annual reports of accounts to the Minister of Finance. These accounts are then examined by the Bureau of Public Accounts of the Finance minister's department, which prepares a general account of the nation's finances. Second, this report is submitted to an independent commission of nine members appointed by the President, who compare the accounts with the original records and report to the Assembly. Third, there is a judicial control by the Court of Accounts, an independent body composed of judges appointed for life. The Minister of Finance submits all the accounts to this court, which performs a duty somewhat similar to that exercised by the Comptroller and Auditor-General and the Committee of Public Accounts in England. This court does not judge the officer responsible for irregularity but leaves it to the Minister of Finance to institute proceedings either civil or criminal to penalize officials responsible for irregularities. An annual report of the Court of Accounts is submitted to the President. Parliamentary control is limited to formal sanction, which is done by the passage of the law of accounts—an act formally approving the expenditures of the budget.

Consult Ford's *Cost of Our National Government;* Agger's *The Budget in the American Commonwealths;* Stourm's *The Budget;* Mallet's *The British Budgets 1887–1913;* Collins' *The National Budget System and American Finance;* Fitzpatrick's *Budget Making in a Democracy;* Willoughby's *The Problem of a National Budget;* Willoughby (W. F.), Willoughby (W. W.), and Lindsay's *The System of Financial Administration of Great Britain;* Villard and Willoughby's *The Canadian Budgetary System;* Willoughby's *Movement for Budgetary Reform in the States;* Harrington's *The Executive Budget in Governors' Conference Proceedings of 1916;* American Academy's *Public Budgets;* N. Y. Bu. of Mun. Research's *How Should Public Budgets be Made;* U. S. Budget Select Committees' *Hearings on the Establishment of a National Budget System;* Acker's *Budgetary Laws;* Skelton's *Canadian Federal Finance;* Higg's *Financial System of the United Kingdom;* Lowrie's *The Proper Function of the State Budget;* Cartwright's *County Budgets and their Construction;* Upson's *Budget Making for Small Cities;* Miles' *The Budget and the Legislature;* Merriam's *Budget Making in Chicago;* Cleveland's *Evolution of the Budget Idea in the United States;* Ford's *Budget Making and the Work of Government;* Geiser's *The German Municipal Budget and its Relation to the General Government;* Fairlie's *Budget Methods in Illinois;* Braddock's *Some Suggestions for Preparing a Budget Exhibit;* Glick's *Evolution of the Budget in Massachusetts;* Cleveland and Buck's *The Budget and Responsible Government;* Fairlie, (J. A.) *Municipal Administration;* Power's *Municipal Budgets and Expenditures;* Bastable's *Public Finance;* Fisk's *English Public Finance.*

Budissin. See Bantzen.

Büdos-Hegy, bu′dēsh-hed′y, a volcanic peak of the Carpathian Mountains, in the eastern part of Transylvania. It is some 3,000 feet high and is known as the 'Stinking Mountain,' due to the fumes from the vast beds of sulphur nearby.

Budrum, bo͝od-ro͞om′, Budrun, or Boodroom, seaport, Asia Minor, is situated on the north shore of the Gulf of Cos; 96 miles south of Smyrna. It is the site of ancient Halicarnassus (q.v.). Pop. 6,000.

Budur, bo͝o-do͞or′, or Burdur, town in Anatolia, Asia Minor, 68 miles north of Adalia. Industries are linen-weaving and leather-tanning. Pop. 17,000.

Budweis, bo͞ot′vīs, town and bishop's see, Bohemia, on the Moldau, 84 miles southeast of Pilsen. It is an active trading and industrial town, manufacturing stoneware, needles, nails, pencils, beer, cigars, spirits and flour. The cathedral (1500), municipal museum, and episcopal residence are notable. Pop. (1911) 45,137.

Budworm, or Bollworm, is the name in the Southern United States for the caterpillar of a very destructive moth (*Heliothis armiger*), better known in the North as the tomato fruit-worm. It attacks the flower buds of the corn (maize) and the bolls of the cotton plant. It also feeds upon a great variety of garden vegetables and flowers. See Bollworm.

Buell, bū′el, Don Carlos (1818–98), American soldier, was born in Lowell, O. He was graduated from West Point in 1841, and served as first lieutenant in both the northern and southern campaigns of the Mexican War, winning the brevet of captain at Monterey, and that of major at Contreras and Churubusco. Soon after the outbreak of the Civil War he was made brigadier-general of U. S. volunteers, and in March, 1862, major-general. In November, 1861, he was placed in command of the Department of the Ohio, succeeding Gen. Sherman. He occupied Bowling Green, Ky. (Feb. 14, 1862), and, after marching from Nashville, Tenn., arrived on the battlefield of Shiloh in time to take part in the second day's fighting, his arrival making certain a Federal victory (see Shiloh, Battle of). Soon afterward he was pitted against Gen. Bragg in Kentucky, reached Louisville first in a race for that city, and then pursued Bragg, who, after the indecisive battle of Perryville, withdrew into Tennessee (see Perryville, Battle of). Buell was severely criticised for not pushing the pursuit with greater vigor, and on Oct. 24, 1862, was superseded by General Rosecrans. On June 1, 1864, he was mustered out of the volunteer service. Consult his defence in *Statements of Major-General Buell* (1884).

Buenaventura, bwā′nä-ven-to͞o′rä, seaport, department Cauca, Colombia, 10 miles from the Pacific at Choco Bay, and 110 miles northwest of Popayán. It is the terminus of a railroad through the Cordillera Occidental from Buga, and is connected by cable with Panama. Pop. 5,000.

Buena Vista, bwā′nä-vēs-tä, city, Rockbridge County, Virginia, on the north branch of the James River, and on the Norfolk and Western, and the Chesapeake and Ohio Railroads; 40 miles northwest of Lynchburg. It is a manufacturing town, producing iron, fertilizer, tannic acid, paper, leather, brick, flour, and corn meal. Pop. (1900) 2,388; (1910) 3,245; (1920) 3,901.

Buena Vista, Battle of, an important and decisive battle of the Mexican War, fought a short distance southeast of the little village of Buena Vista, state of Coahuila, Mexico, on Feb. 22–3, 1847, between an American force of about 5,000 under Gen. Zachary Taylor and a Mexican force of about 20,000 under Gen. Santa Anna. Most of General Taylor's regular troops having been withdrawn a short time before to reinforce General Scott, Taylor was left in a greatly weakened condition. Santa Anna attempted to take advantage of this; but Taylor, who was occupying a strong position, by excellent generalship and the intrepidity of his troops, beat back the Mexican attacks. The American loss in killed and wounded was about 750; that of the Mexicans about 2,000. See MEXICAN WAR.

Buen Ayre, bwen ī′rā, (Fr. *Bonaire*), the most easterly of the Dutch West Indies, off the western end of the Venezuelan coast, in lat. 12° 10′ N., and long. 68° 25′ W. Area, 95 square miles. It is a dependency of the Curaçao colony and has a port called Buen Ayre at the eastern extremity. The chief products are timber and cattle. Pop. 6,500.

Buenos Aires (AYRES), bwā′nōs ī′rās ('good air'), the most populous and progressive province of the Argentine Republic. It is bounded on the north by the provinces of Córdoba, Santa Fé, and a part of Entre Rios, on the east and south, by the Atlantic Ocean, and on the west by El Pampa territory and part of the Territory of Río Negro. The area is 117,777 square miles, the surface for the most part a vast plain intersected by numerous streams and studded with lakes. Two low mountain ranges, the Sierra de la Ventana and the Sierra del Tandel, cross the southern part. The principal rivers are the Paraná, which separates the province from Entre Rios on the north, and the Salado del Sur (400 miles).

Buenos Aires is essentially an agricultural country devoted to cattle raising and wheat growing. Alfalfa, sugar, and tobacco are also raised. Mineral resources are scanty, but marble, stone, lime, slate, granite, petroleum and salt are found in limited quantities. Manufacturing thrives in some of the larger towns. The roads are good and the rivers are in general navigable. The Atlantic coast, 740 miles in length, and the river Paraná, 150 miles, contain twelve ports, the chief being Ensenada and Bahia Blanca, besides Buenos Aires, which has been federalized. The capital of the province is La Plata. Extensive lands have been acquired by the Jewish Colonization Association, some of which are under cultivation. The school system, which has been inadequate, is being extensively improved. Pop. (in 1908, excluding city of Buenos Aires) 1,647,029.

Buenos Aires, capital of the Argentine Republic, is situated on the west bank of the Rio de la Plata estuary, which is 30 miles wide at that point; 150 miles from the Atlantic Ocean. It is the largest city in South America and, aside from Paris, the largest city of the Latin races in the world. It is situated on a level plain about 25 feet above the sea. Six railroads have their terminal stations in the city and twelve transatlantic steamship lines make it their terminus. The climate is temperate, ranging from 55° to 79° F.; frost seldom occurs, and rainfall is abundant, averaging 34 inches annually.

The city is uniformly laid out, the streets, which are well-paved and well lighted, intersecting at right angles. The finest of these is the Avenida de Mayo, over a mile in length. There are several wide boulevards, and many beautiful parks, walks, and squares, the finest being the Plaza 25 de Mayo, adjoining which are the Government House, the Cathedral, the Hall of Congress, and other public buildings. A fine statue of Liberty occupies the open square. San José de Flores, 5 miles southwest of the city, Belgrano, 5 miles northwest, and Barracas, 3 miles to the south, are beautiful suburbs, dotted with 'quintas' or country-seats, with well laid-out gardens. Palermo Park, 2 miles north, on the bank of the La Plata, covers 840 acres and has a fine zoological garden. The Recoleta, or Roman Catholic cemetery, lies between Palermo Park and the city.

Buenos Aires has one of the most complete tramway systems in the world, consisting of nearly 500 miles of line and carrying some 355,000,000 passengers annually. In order to relieve congestion in the business section an underground tube was opened in 1916.

The principal public buildings are the Casa Rosada, or Government House, the University (with 4,650 students), with the state museum and library (containing 200,000 volumes), the Cathedral, post-office, fine terminal station of the Great Southern Railroad, the Exchange, and the new Hall of Congress. The present Cathedral, built in 1752, resembles the famous Madeleine of Paris. It holds 9,000 persons and the archbishop is head of the Roman Catholic Church in Argentina. There is an imposing opera house, comparable with that of Paris; and the Jockey Club is said to have the most magnificent clubhouse in the world. The centre of the town has been practically rebuilt since 1885, stately buildings of European design replacing former one-storied whitewashed houses, and tall steel-framed buildings springing up in the congested business district.

The municipal water-works system and the public school system are constantly being improved. There are good banking facilities, and a large number of newspapers in both Spanish and English are published.

The industrial life of the city is growing rapidly. In 1918 there were 11,400 factories and workshops employing 150,000 men. Shoes, blankets, cotton, flour, glass, machinery, hats, tobacco, leather and canned goods are manufactured. Exports, consisting chiefly of meat, grain, leather and wool, were valued at about $223,312,000 in 1915. The chief trade is with Great Britain. In spite of great improvements the city's docking facilities are somewhat inadequate. The only natural harbor is the mouth of a small river, the Riachuelo. The chief harbor was constructed at enormous expense but the channels require constant dredging to keep them open. The Puerto Madero docks cover three miles of water front, and a port of entry established at Ensenada, about thirty miles down the La Plata, is connected with the city by rail. Four new docks with a depth of 33 feet are in course of construction.

Since 1850 Buenos Aires has had a rapid gain in population. During the last quarter of the nineteenth century, when the attention of Europe was drawn to the exceptional resources and business opportunities of the Argentine Republic, immigration, chiefly Spanish, Italian, French, and Russian, reached large proportions. Pop. (1909) 1,231,698; (est. 1913) 1,444,082.

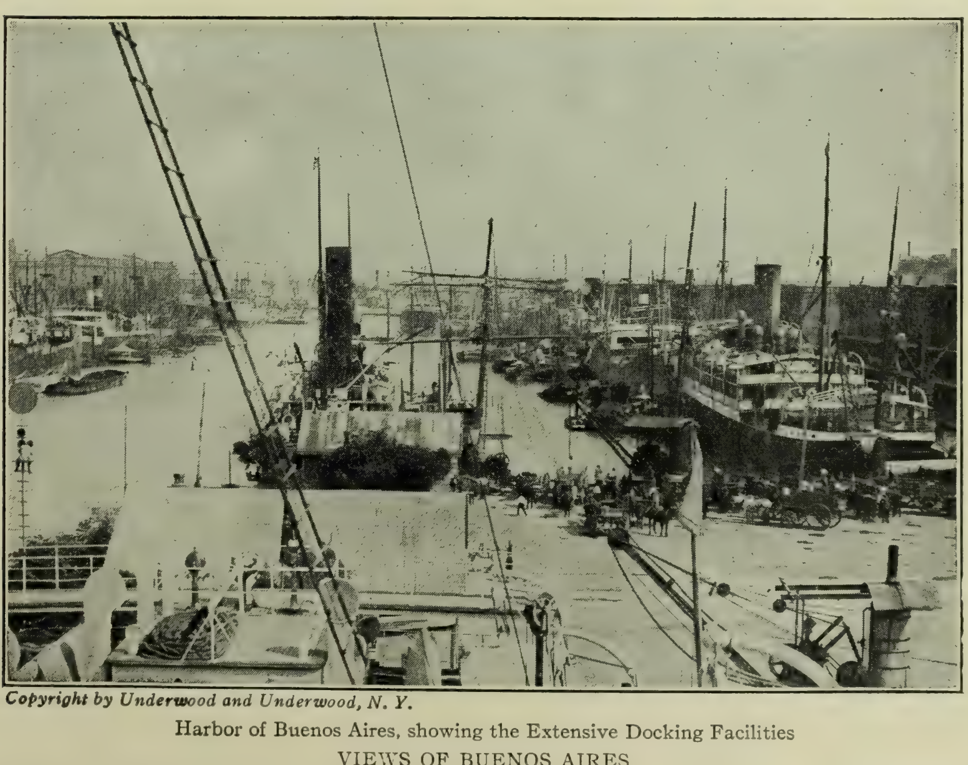
History.—Buenos Aires was founded in 1530 by a Spaniard, Pedro de Mendoza, and French, English, and Dutch attempts to capture it proved unavailing. At the time of the insurrection of Spanish-American colonies against Spain, it took a prominent part in the struggle, and the revolutionary Congress met here in 1810. In 1816 it became the capital of the Republic of the United Provinces of the Rio de la Plata, a name superseded by that of the Argentine Republic. In 1851 Buenos Aires seceded from the Republic and became a separate state until 1859, when it reëntered the confederation. In 1880 it was declared Federal property and became the capital of the country. In 1910 the centenary of Argentine independence was celebrated by an international exposition held in the capital.

Consult Barrett's ***Municipal Organization in the Capitals of Latin America***, in ***Bulletins*** of the International Bureau of American Republics (1909).

Buer, bo͞or, village, province Westphalia, Prussia, 9 miles north of Essen, with coal-mining. Pop. 32,000.

Buff, CHARLOTTE (1753–1828), inspired in Goethe the passion of love on the occasion of a visit he paid to her native town of Wetz-

Avenida de Mayo



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Harbor of Buenos Aires, showing the Extensive Docking Facilities

VIEWS OF BUENOS AIRES

lar in 1772. She was the prototype of the heroine of his *Werther*. See GOETHE.

Buf'falo, a kind of wild ox with the horns flattened and angulated, not rounded as in oxen and bison, and placed below the vertex of the skull. The back has a distinct ridge in the region of the withers. The true buffaloes are confined to the Old World, occurring especially in India and Africa, but the name is popularly applied also to the bison (q. v.) of North America.

The large Indian, Asiatic, or Water Buffalo (*Bubalus buffelus*) has beautiful twisted horns, somewhat triangular in section, thick and broad at the base, and with a spread sometimes as great as six feet. The hair is short and scanty, almost bristly, slightly longer on the head, shoulders, and front of neck, and almost black in color. The bare brown polished hide is, however, the more striking feature. The animal measures about 7 feet in length, and stands about 4 feet high at the shoulder. It walks or runs with the horns lying back on the shoulders and the muzzle projecting characteristically forwards. It frequents marshy lands, preferring for its food the rank coarse herbage which they afford.

This buffalo is a powerful animal, capable of dragging or carrying a far heavier load than the ox. It exhibits a considerable amount of intelligence and in a state of domestication is capable of becoming very docile. In a wild state the animal is savage and dangerous.

Two species of buffalo are commonly attributed to Africa—the Cape Buffalo (*B. caffer*) and the West African species (*B. pumilus*), but it is not certain that the two are distinct. The Cape, or Black, Buffalo is a large, fierce animal and is never domesticated. It measures about 8 feet from the root of the horns to the tail, and the height is 5½ feet. The hair is dark brown, nearly black, and sparse except on the ears and tip of the tail. This species, like the Indian variety, is found in marshy swamps and feeds on aquatic plants. Large herds of Cape buffaloes were formerly seen, but their numbers have been so depleted by sportsmen that bands of five or ten are now more common. Buffaloes are also found in Egypt, the Sudan, Hungary, Spain, and Turkey. A small species, known as the Anoa, is native to Celebes (see ANOA).

Buffalo, city and port of entry, New York, county seat of Erie county, and one of the most important commercial and manufacturing cities in the United States, second in population in the State and twelfth in the United States. It is situated at the eastern end of Lake Erie, at the head of Niagara River, 20 miles above the Falls, and is the western terminus of the Erie Canal. It is served by the New York Central lines (New York Central, West Shore, Lake Shore, Nickle Plate, Michigan Central) and by the Erie, the Lackawanna, the Lehigh Valley, the Grand Trunk, the Pennsylvania, the Wabash, the Buffalo, Rochester and Pittsburgh, the Toronto, Hamilton and Buffalo, the Pere Marquette, the Buffalo Creek (terminal), and South Buffalo, (terminal) Railroads.

Buffalo is beautifully situated on a plain rising gradually from the lake and covers an area of 42 square miles. There are more than 600 miles of paved streets, generally shaded by fine trees. Delaware Avenue is the leading residential street, and Main Street, running north from the lake, the principal business thoroughfare. Other notable streets are North, Summer, Front Avenue, Richmond Avenue, Broadway, and Lincoln Parkway. The park system comprises 1,229 acres and includes six large parks—Delaware (365 acres), Riverside (48 acres), Humboldt (56 acres), Cazenovia (106 acres), South Park (155 acres), and The Front (48 acres)—seventeen beautiful park approaches, and thirty smaller parks scattered throughout the city. In South Park there is a fine Conservatory, and adjoining Delaware Park are the beautiful grounds of the State Insane Hospital and Forest Lawn Cemetery. Four public markets are conducted by the city, and it maintains seventeen city playgrounds.

Buffalo has an abundant water supply from the lake, and all water is sterilized by means of liquid chlorine. The street railway system comprises over 223 miles, and seven interurban traction lines enter the city.

Among the principal buildings are the U. S. Government building, erected at a cost of $2,000,000, the City and County Hall, Music Hall, the State Armory and Arsenal, State Insane Asylum, Albright Art Gallery, Masonic Temple, Grosvenor Free Library, Ellicott Square Building, Buffalo Historical Society, and General Hospital. There are sixty hotels, of which the Iroquois, Lafayette, Lenox, Statler, and Genesee are noteworthy.

Institutions for higher education include the University of Buffalo (q. v.), State Normal School, Buffalo Seminary for Girls, Academy of the Sacred Heart, and Martin Luther Seminary. There are two municipal libraries with about 400,000 volumes. The Buffalo Library building also houses the Fine Arts Academy and the Society of Natural Science. The public school system is excellent and in 1921 included 2,700 teachers and 65,000 enrolled pupils. There are 5 high schools, 63 grammar schools, 4 vocational schools, and one training school, as well as evening, vacation and Americanization classes, and an 'opportunity school.' Among charitable institutions are the Orphan Asylum, Orphanages of St. Vincent and St. Joseph (R. C.); the Social Service Building, a centre of philanthropic work, containing the offices of the Buffalo Charity Organization Society, the first of its kind founded in the United States; the Children's Aid, Children's Hospital, and the Adam Memorial Hospital.

Commerce and Industry.—By virtue of its position and commercial facilities, Buffalo is one of the country's greatest ports. It is an important railroad centre and is the terminus of several steamship lines. The Barge Canal connects it with the Hudson and New York City; the Welland Canal, connecting Lake Ontario and Lake Erie, gives access to ports on Lake Ontario and the St. Lawrence, and steam ferries and the International Bridge connect it with Canada. Federal, State, and municipal enterprise have all contributed to the improvement of shipping facilities. Buffalo River has been dredged and Black Rock Harbor converted into a ship canal, so that there is now a lake port of over 3 miles and a river front of 17 miles. Buffalo is an immense grain port, handling the bulk of the grain from the Western States and the Canadian Northwest *en route* to the Atlantic seaboard. Its 22 grain elevators have a capacity of 30,600,000 bushels, and in 1920 received 128,697,528 bushels of grain. It has also a large trade in lumber, fresh fish, coal, copper, stone, and livestock.

Manufacturing industries include iron and steel production, manufactures of steel cars and car wheels and of machinery, oil refineries, slaughtering and packing establishments, brickyards, and soap, starch, cigar, furniture, leather, stove, surgical instruments, carriage, harness, and cutlery factories. Power for these industries is obtained chiefly from Niagara Falls, but a part is procured from a steam generating plant recently completed. According to the Census of Manufactures for 1914, the number of industrial establish-

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VIEWS IN BUFFALO.

1. Albright Art Gallery, Delaware Park. 2. Lafayette Square. 3. Great Northern Elevator and Shipping. 4. Main Street.

ments is 2,225, with an invested capital of over $243,000,000 and products valued at $337,000.000.

The ***population*** of Buffalo in 1920 was 506,775. The rapid growth of the city is indicated by successive census figures. In 1820 the population was 2,095; in 1840 it had risen to 18,213 and in 1860 to 81,129. It was 155,134 in 1880; 255,664 in 1890; 352,387 in 1900; and 423,715 in 1910.

Government and Finance.—Since January 1, 1916, Buffalo has been governed by a Council, consisting of a mayor and four councilmen, elected for a term of four years, and exercising executive, administrative, and legislative powers. The government is divided into five major departments, designated as the Department of Public Safety, Finance and Accounts, Public Works, Parks and Public Buildings, and Public Affairs. Other officials are nominated by the mayor and appointed by the Council. The mayor has no veto powers, but votes in the sessions of the Council.

On July 1, 1921, there were twelve commercial banks and trust companies and four savings banks. The discount banks had a total capitalization of $20,000,000 and deposits amounting to $241,294,528. The four savings banks have 177,820 depositors, $130,744,470 in deposits, and a surplus of $14,766,804. Bank clearings in 1920 totaled $2,293,015,689.

The assessed valuation of the city for the fiscal year 1920–21 was $608,178,150. The total bonded debt is $43,222,596.

History.—In 1798, Joseph Ellicott, agent of the Holland Land Company, began the first survey for the town of Buffalo, which he called New Amsterdam. This survey was completed in 1805. In 1806 the first schoolhouse was built, and in 1810 the town of Buffalo, so called from the visits of the bison to the neighboring saltlicks, was incorporated. The first village charter was granted in 1813, and in 1832 Buffalo was made a city. During the War of 1812 Buffalo was the scene of several naval engagements and in 1813 the town was burned by the British. The building of the Erie Canal gave to the city its commercial importance, and from its opening in 1825 Buffalo increased rapidly in wealth and population. In 1901 the Pan-American Exposition (q. v.) was held in Buffalo and President McKinley was assassinated (Sept. 6) here by an anarchist fanatic who was promptly tried and executed. Consult Powell's *Historic Towns of the Middle States.*

Buffalo Berry (*Shepherdia argentea*), a shrub found in the northwestern part of the United States, especially in the Upper Mississippi valley, whose branches are thickly covered in the autumn with silvery leaves and clusters of crimson berries somewhat resembling the red currant. It is cultivated for ornamental purposes, and the berries are sometimes used to make jellies.

Buffalo Bill. See Cody, W. F.

Buffalo Bird. See Oxpeckers.

Buffalo Fish, one of the large hump-backed suckers of the family Catastomidæ and genus Ictiobus, of which several species dwell in the Mississippi River and its tributaries. Its flesh is of little value.

Buffalo Gnat, a gnat (*Simulium meridionale*) of the interior of the United States, related to the Eastern blackfly (q. v.), and annoying to cattle and smaller animals. Its mode of reproduction and habits are similar to those of the mosquito. When first encountered by frontiersmen they thronged about the bison herds.

Buffalo Grass (*Bulbilis dactyloides*), a grass common to the western plains of North America, from Manitoba to Texas. It is usually about 6 inches high; it spreads by runners as well as by seed, and soon forms a thick sod. It is an excellent pasture grass and furnishes nutritious food for all kinds of stock.

Buffalo Moth, a name given to the larva of a beetle (see Carpet Bug) under the erroneous idea that it was the young form of a moth, and because it first began to be observed in the neighborhood of Buffalo, N. Y. It destroys carpets, woollens, etc.

Buffalo, University of, a co-educational institution of learning established in Buffalo, N. Y., in 1846. It consists of colleges of medicine, pharmacy, law, dentistry, arts and sciences, and a teachers' college. For the first forty years of its existence it consisted solely of the college of medicine. In 1901 the Gratwick Cancer Laboratory, the first in the world to be established for the study of cancer, was erected here. For latest statistics see Table of American Colleges and Universities under the heading College.

Buf'fington, Adelbert Rinaldo (1837–), American soldier, was born in Wheeling, W. Va. He was graduated (1861) from West Point, and began service in the ordnance department of the army, with which he was always associated. During the Civil War he served principally in Missouri, New York, and Southern ports, being in command of the New York arsenal in 1863–4. After the war he was in general service and was then assigned to the command of the national arsenal, Springfield, Mass. (1881–92), and to the Rock Island arsenal (1892–7). He was made brigadier-general and chief of ordnance, U. S. A., in 1899, and retired in 1901. General Buffington made many inventions in connection with small arms and gun carriages.

Bufflehead, a common small fresh-water duck of the north temperate portions of North America (*Charitonetta albeola*), so called because the long feathers on its head suggest the shaggy mop about the head of the bison ('buffalo'). It is about 13 inches in length and has a handsome plumage and delicate flesh, and is a favorite among sportsmen.

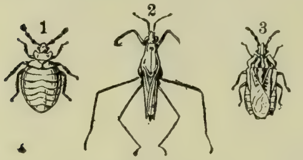
Buffon, buf'un, George Louis Leclerc, Comte de (1707–88), French naturalist, was born in Montbard (Côte d'Or) in Burgundy. During his early manhood he published many scientific treatises, and this resulted in his election as a member of the Academy of Sciences, and in his appointment in the same year (1739) as superintendent of the Jardin du Roi, the present Jardin des Plantes and Museum of Natural History. This was the turning-point of his career, and after ten years' assiduous labor there appeared in 1749 the first three volumes of his famous *Histoire Naturelle,* in the production of which he was assisted by Daubenton. Succeeding years brought forth fresh volumes, the work in its final form consisting of forty-four volumes, eight of which were published after Buffon's death. A second edition of thirty-six volumes was published in 1774–1804. The naturalist was created Comte de Buffon by Louis XV., and enjoyed the favor and friendship of Louis XVI. His *Histoire Naturelle* is now almost obsolete, and of comparatively little scientific value, but it had an immense popularity in its day.

Buford, bū'ferd, John (1826–63), American soldier, was born in Woodford county, Ky. He was graduated (1848) from West Point, and was engaged in service on the plains up to the time of the Civil War. In that contest he was assigned to active duties with the rank of brigadier-general (1862), took part in General Pope's campaign in Northern Virginia, and was wounded at Manassas. Later in the year he commanded a cavalry brigade in the Army of the Potomac, and was thereafter prominent in all its engagements, particularly at Gettysburg, until transferred to the Army of the Cumberland just before his death (Dec. 16, 1863), on which day he was commissioned a major-general.

Bug, bo͞og, the name of two rivers of Russia. The ***Southern*** or ***Black Sea Bug*** rises in Volhynia and follows a southeastern course through the governments of Podolia and Kherson, to Nikolaiev, where it forms a *limen* (estuary) 30 miles long, which joins that of the Dnieper. It is 450 miles long but is navigable only from Nikolaiev to the sea. The Southern Bug is the Hypanis of Greek and Roman geographers, the Ak-su of the Turks.

The ***Western*** or ***Polish Bug***, an affluent of the Vistula, rises on the eastern slope of the Carpathians, in Galicia, and falls into the Vistula at Novo Georgievsk (Modlin), some 20 miles northwest of Warsaw, after a course of 450 miles. Of its whole extent, more than half is navigable for vessels of moderate size.

Bug, a name used sometimes to denote all the insects included in the order Hemiptera and sometimes reserved for one section of this order, the Heteroptera. Bugs are characterized by the fact that the mouth is adapted for sucking; their food consists of the juices of plants or the blood of animals; and as reproduction is frequently very rapid, they may be of great importance in connection with agriculture. They include arboreal, terrestrial, and marine forms. See HEMIPTERA; HETEROPTERA; BED BUG; BOAT FLY; CHINCH BUG; WATER BUGS.



Bugs.

1. Bed-bug; 2. Skater (aquatic); 3. A bark-bug (*Aradus depressus*).

Buga, bo͞o′gä, town, state of Cauca, Colombia, is situated in the Valley of the Rio Cauca, at an elevation of 6,000 feet, 3 miles from the river, and 55 miles by rail from the Pacific port of Buenaventura. The fertility of the region is famous, and large shipments of coffee and sugar-cane are made from this point. The town dates from 1570. It was called Nueva Galicia by the early settlers, who were Galicians. Pop. 13,000.

Bugasón, bo͞o-gä-sōn′, pueblo, Antique province, Panay, Philippine Islands, is situated on the west coast of the island; 24 miles north of San José de Buenavista. Pop. 14,000.

Bugeaud de la Piconnerie, bü-zhō′d′lä pē-kōn-rē′, THOMAS ROBERT (1784–1849), Duc d'Isly and marshal of France, was born in Limoges, joined the army as a private (1804), and rose to the rank of colonel (1815). By the revolution of July, 1830, he obtained a seat in the Chamber of Deputies; he won the favor of Louis Philippe, and was sent to quell the Arabs in Algeria (1837). His success over Abd-el-Kader led to his creation as marshal of France, and his victory over the Moors at Isly (1844) won his ducal title. He governed Algeria (1840–7) and died of cholera at Paris.

Bugenhagen, bo͞o′gen-hä′gen, JOHANN, or DR. POMMER (1485–1558), German Protestant reformer, was born on the island of Wollin, in Pomerania, and entered the priesthood. He was converted to the doctrines of Luther in 1520, and became a close and lifelong friend of the great reformer. In 1522 he settled as pastor and university professor at Wittenberg, and wrote a Commentary on the Psalms (1524); but his most arduous work was assisting in Luther's translation of the Bible, and in organizing the reformed church in Germany (Hamburg, Lübeck, Pomerania) and in Denmark (1537). He also wrote a *History of Pomerania* (1728; new ed. 1901).

Bugge, bo͞og′e, ELSEUS SOPHUS (1833–1907), a Norwegian antiquary and philologist, was born in Laurvig. He was educated in Christiania, Copenhagen, and Berlin, and in 1866 became professor of comparative philology and of the Old Norse language at Christiania. His specialty was old Norse literature and archæology, including the Germanic languages, and notably Anglo-Saxon. As early as 1858 he showed his interest in old Norse folk-songs by publishing *Gamle Norske Folkeviser;* and in 1867 he issued an edition of the songs of the *Edda* under the title *Norræne Fornkvædi.* His works embrace *Studier over de Nordiske Gude og Heltesagns Oprindelse* (1881–9); *Norges Indskrifter med de Aeldre Runes* (1891); *Norræne Skrifter af Sagnhistorisk Indhold* (1864–73); *Bidrag til den Aeldste Skaldedigtnings Historie* (1894); *Lykische Studier* (1897; English trans., *The Home of the Eddic Poems,* by Schofield); *Studies on Northern Mythology* (trans., Stephens, 1884).

Buggy, a light, one-horse, four-wheeled vehicle with or without a hood. In England the term is applied to a light two-wheeled vehicle with no hood. See CARRIAGES.

Bugis, bo͞o′jēz, or BUGINESE, a Malayan people originally inhabiting the southern peninsula of Celebes, but now spread all over the East Indies as merchants and traders. They are lighter in color than the Malays, are superior to them morally, and resemble the Javanese in appearance. They are Mohammedans by religion; speak a Malayo-Polynesian dialect akin to the Macassar, and have a written literature. See BONI.

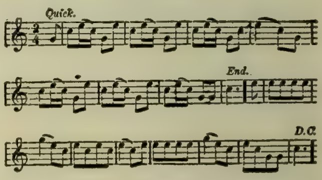
Bugle, bū′g′l (*Ajuga*), a palearctic genus of Labiatæ. The Common Bugle (*A. reptans*) is abundant in Europe. Its flowers are generally blue, but white and purplish varieties are sometimes grown in flower borders. *A. alpina* is one of the beautiful flowers of the Swiss Alps.

Bugle, a treble wind instrument of copper or brass emitting a penetrating note, used for purposes of military signalling (see BUGLE CALLS). It has a smaller bell and a shorter tube than the trumpet. It is made in the key of B♭, and its effective notes are the open notes of the tube—C (below the stave), G, C, E, G.

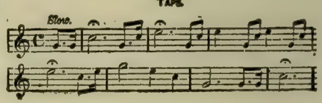
Bugle Calls are used as *warning* and *formation* calls to denote the hours of service, alarm calls, such as *Fire Call, To Arms, To Horse, etc.,* and as drill signals to large or scattered bodies of troops, as when drilling in extended order. The drill signals include both preparatory commands and commands of execution, and officers and men are required to be thoroughly familiar with these and all other bugle calls. The drill signals are more easily memorized by remembering that all movements to the right are on the ascending scale, the same movements to the left are corresponding signals on the descending scale, and that changes of gait are all on the same note. In a garrison where no band is stationed, the bugles play for marching, having replaced the fife and drum for this purpose. Each company, troop, and battery has two buglers, or trumpeters.

The following are a few of the more generally used bugle calls in the U. S. army:

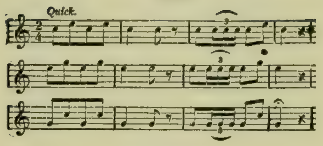
REVEILLE.



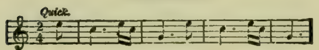
TAPS.



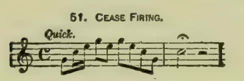
Mess.



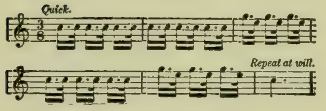
Commence Firing.



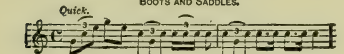
51. Cease Firing.



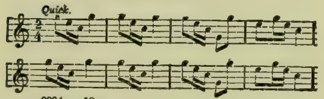
Charge.



Boots and Saddles.



10. Adjutant's Call.



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Bu'gloss, a name popularly applied to many plants of the natural order Boragineæ, more strictly to *Anchusa* (*Lycopsis*) *arvensis*, a common weed in cornfields in Britain. The beautiful *Echium vulgare* bears the English name of viper's bugloss. Both these plants are naturalized in the United States.

Buguruslan, bōō'gōō-rōōs-län', town, Russia, in Samara government, 106 miles northeast of Samara. It has trade in cattle and leather, and farming is the chief industry. Pop. 15,000.

Buhi, bōō'hē, pueblo, Luzon, Philippine Islands, in Ambos Camarines province, on Buhi Lake, 29 miles southeast of Nueva Caceres. Pop. 10,000.

Buhl Work, bŭl, or more correctly BOULLE WORK, a species of marquetry invented by Charles André Boulle (q.v.), a French woodcarver. Tortoise-shell, brass and rosewood are the materials most frequently used in this kind of inlaid work, and the effect is highly decorative. This artistic method of treatment is applied to the more ornamental articles of furniture, such as drawing-room tables, clock cases, and *bric-à-brac* stands.

Buhrstone, bûr'stōn, or BURRSTONE, a name given to certain quartzose rocks, the worked surfaces of which possess the property of cutting or grinding. They are used principally as millstones. The best kinds are of creamy white, with a granular and somewhat cellular texture, and are obtained in the Tertiary formation of the Paris basin and the surrounding district. American production is supplied chiefly from New York, Virginia and Pennsylvania, and, for their present uses in the grinding of the coarser mill products, are considered entirely satisfactory.

Building. The erection of any edifice is the work of several distinct trades, and an account of masonry, bricklaying, carpentry, steel and iron construction and the like, will be found under their several titles. Here we shall indicate the manner in which these trades coöperate under the architect and general contractor. Excavation is measured by the cubic yard. 'Sheath-piling' or timbering the sides of excavations is necessary in soft ground, and is measured by the square yard; and concrete work is measured by the cubic yard when above 12 in. thick, but by the superficial yard when below that thickness. The *damp-proofer* lays a 'damp course' on the top of masonry walls, just above ground-level, consisting of three to five layers of tarred felt, each well coated with hot asphaltum applied with a brush or mop. The whole surface under the building may be damp-proofed in this manner over a layer of broken stone or concrete and a bed of concrete is placed above this to prevent it from being forced up by water. In deep excavations this is often three feet in thickness and is usually reinforced with steel. *Mason work* is carried out by brick masons and by stone masons. Earthenware drains are set by the brick mason, or under certain conditions by unskilled labor, and all cut stone is set by the stone contractor, who lays no brick. Rubble walls are measured by the superficial or cubic yard. All stones used as plinths, jambs, heads of window openings, cornices, etc., are measured by the cubic foot; plain, sunk, and moulded work on these by the superficial foot; narrow margins, grooves, etc., by the linear foot; and mitres, cuspings, etc., are numbered. Brick walls are measured by the cubic foot, the thickness being figured, as 8-inch, 12-inch, 16-inch, etc., and all openings deducted. Fireproof floors of concrete or terra-cotta and partitions of hollow tile are set by a separate contract. Tile, terrazzo and mosaic floors, hearths, mantel facings, bath-room floors and wainscots of ceramic tile, heating and ventilating apparatus are handled by separate contractors.

The many subdivisions of work on a modern building have brought about the formation of large 'construction companies,' that handle the clerical detail incident to the erection of an important building, and relieve the architect of much labor. The *carpenter* has to put in lintels and bucks; floor-joists; roof, consisting of joists, rafters, and tie beams, covered with a layer of sheathing; the studding is erected for lath and plaster partitions; and furring strips are nailed to the under side of joists; while strips are nailed along the sides of each joist for the pugging-boards to rest on. The *roofer* sets the leader heads or baskets, and the leaders and gutters are furnished and set by the *sheet-metal* contractor, to be connected to the house drain by the *plumber*. The *plumber* puts in the pipes and cisterns of the water supply; sets the boiler of the kitchen range; is responsible for the baths, sinks, wash-tubs, water-closets, vent and soil pipes, traps, etc. The gas-pipes are set by a separate contractor or by the plumber. The *roofer* covers the sheathing with a layer of building paper, over which he nails the slates; or if tiles are preferred, he nails on horizontal strips to give the tiles the proper tilt, and affixes the latter. Slating is reckoned by the square yard. Shingled roofs are constructed by nailing strips of wood to the rafters at proper intervals, no sheathing being used in many cases. Tin or copper is widely used for flat or deck roofs, the tin being in small sheets, which are soldered by the *roofer* and laid on the sheathing. The *structural iron contractor's* work includes the providing and erection of steel or cast iron columns, and steel beams and girders.

Beams are measured by the pound, the depth and weight being given; connections, bolts, etc., are numbered. Iron railings and ornamental work are furnished and set by a separate contractor. The *lather* nails laths horizontally to walls and ceilings, leaving just sufficient space between the laths to allow the plaster to form a key between them In fireproof buildings patent metal lathing is used. Then the *plasterer* lays on three successive coats of plaster, the last being of pure lime or of some special cement. In the cheaper grades of work plastering is done in two coats, the first being of mortar gauged with plaster of paris. Cornices, plaster panellings, and mouldings are included in his work. After the first coat of plaster is on the walls, the wiring is done by the *electrical contractor* for bells, lights, etc. When the plaster is dry the *carpenter* returns, inserts windows and all the interior trim, stairs, wardrobes, dressers, etc., and lays the floors. The building is now finished, except for the contracts of the *glazier* and the *painter*, who is responsible for painting, staining, varnishing, papering, white-washing, and size-coloring in the interior, and who protects, by at least three coats of paint, all external wood and iron work from the weather. See BRICKLAYING, CARPENTRY, MASONRY, STRENGTH OF MATERIALS.

Building Acts, or BY-LAWS, statutes enacted by the legislature or regulations of local authorities prescribing in the interests of the public health and safety, the form, height and materials of buildings. In the United States such acts and regulations usually apply only to buildings in towns and cities, but in England, under the Public Health Acts of 1875 and 1890, they were in many cases extended by district councils to the rural districts. Recently, however, local regulations deemed to be vexatious and unnecessarily restrictive of the improvement of rural areas have been modified or withdrawn. The regulations in force in towns and cities are various in character and deal with such matters as the decent and healthful construction and sanitation of hotels and tenement houses, the use of brick, stone or other non-combustible material for houses in the more densely populated districts of cities (sometimes known as the fire area), the depth and thickness of foundations and walls, the height of buildings in narrow streets, and the like. The actual form and the enforcement of regulations of this character are usually committed to the local authorities, who are generally invested with large discretion in adapting them to local conditions. In the United States, where private rights of property are protected by constitutional provisions against legislative interference, the validity of such regulations has frequently been questioned, but their constitutionality has invariably been sustained as a proper exercise of the police power vested in Congress and reserved to the several States. See HEALTH LAWS; POLICE POWER.

Building and Loan Associations, a method of helping people to become 'their own landlords' which is about a century and a half old. It had its beginning in England somewhere about 1785 or 1790 in Birmingham, and soon spread to other countries. The United States has had the greatest development of this plan, which ranks high as an aid to people of moderate means to obtain homes, and to save. The method is used not only in England, but in the British colonies, in Belgium, Germany and to a very limited extent in a few other countries.

In the United States the plan was first tried in Frankford, a suburb of Philadelphia, in 1831; it was tried in New Jersey in 1835, and has now spread into every State in the country, operating on a very large scale. In recent decades, when wealth has increased rapidly among all classes, it has had its greatest growth. In 1900 there were 5,356 Associations with a membership of 1,495,136, and total assets of $571,366,628; and in 1914 this had risen moderately to 6,616 associations with a membership of 3,103,935, and total assets of $1,357,707,000. By 1927 the associations had virtually doubled in number, 12,804 associations, with a membership of 11,333,261, while the total assets had grown to $7,178,562,451. This represents an enormous growth, not equalled in ratio anywhere else in the world. The 1929 figures are over eight billions of assets and over 12,000,000 members, and the movement is still growing.

The average assets per member have doubled in dollar value; being $382.15 in 1900, and in 1928, $668.23. The membership has been multiplied almost tenfold since 1900.

This great growth is explained by the evolution in the character of the building and loan association in America. The original English idea was that of a 'terminating association'; that is, an association which terminated its existence as soon as the loans of the members were consummated. This was the first stage, or first method, used in this country, and is still widely used. The funds or capital of such associations comprise the instalment payments of the members, of interest and premiums paid by those who borrow from it, and various fees exacted. The association is terminated when sufficient has been paid into the association over a period of time, after subtracting expenses, losses, etc., to redeem at face value all the shares issued. This termination marks the time when the objects for which the members have joined have been accomplished.

The association plan permits the average man who has bought a lot on which to build his house, to take say five shares for each $1,000 he requires to finance his building, in the building and loan association, giving a mortgage on the lot and his shares as security. Instead of the money being loaned him at interest rates, the money is auctioned off to members on a bidding plan for the highest premium. The members secure the money to build the house, and as soon as this loan is paid off the association has ended its specific usefulness. Every borrower is a stockholder through his shares and is thus in close touch with the affairs of the lender.

The basic plan of the building and loan association is the community mutual help idea, and its brilliant success is due to the fact that it operates locally in a close community of interest, developing the community where it operates and thus increasing the values of its members, and avoiding danger by its ability to appraise land values accurately from close local knowledge.

With the usual impetus so familiar in America toward over-expansion, the building and loan association in the nineties began a career toward expanding from local into national organizations. The theory was that what worked so well locally, should work equally well nationally. This was an error, as was soon discovered, because of the inaccuracies of land appraisal arising from lack of local familiarity with land values in a national organization. The broad scope operation brought also corruption, excessive overhead expense, and the like, which drained profits. By 1900 national associations had been eliminated, and the building association had been firmly established on a *local* basis, operating within a single State, or on a fifty mile radius limitation, and regulated by the State banking laws.

The logical evolution, it was seen, was not toward geographical width of operation, but toward enlarging the usefulness and efficiency of the local association. This was accomplished by breaking away from the terminating type of association and making the building and loan association permanent; new series of borrowers beginning and ending at various times under the title and organized machinery of a single association.

A third plan was developed in the individual rather than the series plan, with optional payment plans enabling the individual to terminate at any time he could afford it the particular transaction he had with the association. This again increased the economy and flexibility of the building association idea, and in particular enlarged its scope beyond that of saving for building purposes, to saving for any purposes, or for investment alone. The eight billion dollar total of assets is used today to the extent of only 50 per cent. for residence building.

There are various types of building and loan shares, which in series form usually terminate in three, six, or twelve months; some companies, issuing a new series of stock every year. Some issue 'prepaid shares,' at a fixed price payable outright, participating fully in the profits as do the instalment shares, although some limit it to a fixed rate of interest; the additional share in the undivided profits, if any, being held until maturity. This is called the guarantee stock plan, which has had wide advance in the West.

Building and loan shares have, prior to maturity, two values: (1) holding a book value, and (2) withdrawal value; the latter the sum fixed by each association as the value to be paid back in case the shareholder desires to quit membership in such associations as permit withdrawal.

After having passed through its experimental and evolutionary period the building and loan association is now on a remarkably secure basis. Even in the nineties when there was dangerous national expansion, the essentially solid and secure character of these enterprises was noted. The Department of Labor in 1893 made an investigation of the associations, and even in that greatly depressed period only 35 out of the thousands in existence showed any loss, and this loss totalled only $23,000. The very close, well-knit, well-regulated and well-secured nature of the business protects it from loss, and when loss occurs it is relatively small. In the years 1924–1928 inclusive, there have been only 100 failures with an estimated loss of about $3,000,000; the rate of loss being on the average less than one-hundredth of one per cent. As a rule the failures are due to second mortgages and to deflation of real estate values.

During the years 1925–1929 the assets have grown at an average rate of $800,000,000 annually, doubling the total of assets in this period. Ninety-one and a half per cent. of the assets are invested in mortgage loans. The States showing the greatest gain in the last few years are, in order of rank, Ohio, New Jersey, Pennsylvania, California, New York, Massachusetts, Wisconsin, Illinois, Indiana, Texas, Missouri, Michigan.

The building and loan association, it might be said, is an industry and not a banking institution. It sells a concrete product—mortgages on real estate, on long-term credit. If it is a sound building and loan association, it does not borrow on short term notes to render long term credit, which is an uneconomic procedure. It has a statutory right to borrow money to assist in repayment of its maturities, and it lives upon its income. It is a strictly mutual, participating enterprise. In the Middle West, but not in the East, new types of associations have sprung up, which permit waiving of 100 per cent. participation, offering instead a stated dividend on participation if earned. These are organized and operated by a few stockholders and others, not on a participating basis. This borders on a banking business, and as such has not been favored in the eastern part of the country, which is more conservative.

In this field there has thus been created two wings—a conservative wing, and a more radical wing. The advocates for the conservative wing say that the enormous development of the building and loan association is built upon conservatism, it being the third great trustee of the people's savings (after the banks and the insurance companies). It is also maintained that a building and loan association is a public service institution to be regarded as a public trust, and not a device to be commercialized along high-pressure salesmanship lines, or promises which may not be possible to fulfil, and it is pointed out that careless, irresponsible promoters could do irreparable damage to this bulwark of the common people. The radical wing maintains that the building and loan movement is a commercial device like any other, and should apply commercial principles. In the West, where people are less conservative and more given to chance-taking these new forms of associations have had rapid growth.

The conservative wing has drafted a uniform law to be passed by each State, setting up a building and loan commission, whose duty it would be to investigate a building and loan association applying for a charter, and to have power of revocation over charters.

The conservative wing objects to the privately capitalized organization calling itself a building and loan association, which from the time it was first organized was mutual in character and method. They believe that such privately capitalized organizations jeopardize the reputation of the building and loan association, now synonymous everywhere with safety.

The future of the building and loan association is regarded as excellent. There is a movement toward an extensive modernization of homes, and new building, to fit the new consciousness of values in the home, now so widespread as a result of great technical and artistic progress. It has been said that 60 per cent. of the homes of today are obsolete. The construction of new homes will increase rather than decrease, especially in the rural and semi-rural districts, and in this work the building association will necessarily have a large share.

Building Lease, a lease of land in which the tenant undertakes to improve the premises by the erection of dwellings, stores or other buildings of a substantial character. As such buildings when erected become by law a part of the freehold and thus ultimately the property of the landlord, the agreed cost of the improvements is allowed as part of the consideration for the lease, in lieu of rent, and the lease is always for a long term. The rental in such cases is known as a ground rent. The ordinary way of developing a building estate is for the owner of the land to enter into an agreement with a builder to erect a certain number of houses on the land, and to covenant to grant him leases of the several plots as the houses are built. Though leases of this character are not unknown in the United States they are less common than in England, where they constitute a favorite method of securing the improvement of land. See GROUND RENTS.

Building Stone, a stone suitable for use in the erection of buildings. The qualities necessary to a first-class building stone are so many that it is rare to find a material which combines them all and is, at the same time, accessible, abundant, and cheap. One prime essential is ability to resist a great, crushing stress, and to bear the weight of a lofty superstructure. This excludes nearly all clay rocks and shales and such granular limestones as chalk, and renders firm, fine-grained sandstone and crystalline rocks such as granite of special value for some kinds of work, as the pillars and abutments of bridges. Resistance to atmospheric action and weathering is of great importance, especially in structures which are meant to endure. Granite and pure siliceous sandstone in this respect hold the first place; calcareous and ferruginous sandstones, limestones of many different kinds, and marbles are less resistant, but are nevertheless largely employed. A good building stone should also be of uniform and pleasing color; not liable to discoloration on exposure, as are many sandstones which contain pyrites and compounds of iron; obtainable in large blocks and in any quantity; not too expensive to saw and dress; accessible, and easily quarried.

The best varieties of granite are durable, strong, impervious to moisture, and, when of suitable color, have a pleasing and even ornamental effect. Stones that are difficult to dress, or are quarried in remote districts, are too expensive for general use in large towns. There are a great number of localities in the United States where good granites occur. These are distributed through many of the States. All colors are represented from the bright grayish white of Georgia or Connecticut to the red granites of Maine, Wisconsin or Minnesota, or even to the dark bluish-gray granite of Quincy, Mass. Maine, Vermont and Massachusetts, formerly the chief producers, are now supplemented by many others, notably California, North Carolina, Minnesota and New Hampshire. Sandstone has been one of the most widely used of building stones, most of the large cities being to a great extent built of it; but it is now little used. The brown Triassic sandstones of Connecticut and New Jersey are very much used in Eastern cities. The bluestones of New York are the most noted flagstones; while the beautiful, uniform, light buff berea grit of Ohio is a popular building stone. The Hinckley sandstone of Minnesota is much used for paving, and the Jasper and Sioux quartzites of the same State are probably the most durable and expensive building stones of the United States. Limestones are widely employed, especially in the Mississippi Valley. Nearly one-half of the total value of stone produced in the United States is of this rock. Indiana, Pennsylvania, Illinois and New York are the leading producers, the Indiana product alone being nearly twenty million dollars annually. The Bedford Indiana stone which is an oölite is the most noted. Magnesian limestones, which vary greatly in quality, are among the principal building stones in the Mississippi Valley. There are many quarries in Missouri, Wisconsin, Minnesota and other States. There are many fine marbles in the United States and more rarely other decorative stones mostly used for interiors. Serpentine, dolerite, diorite, and basalt are little used as building stones; their dark color and the difficulty in dressing them being sufficient reasons for their neglect. Consult Johnson's *Materials of Construction;* Merrill's *Stones for Building and Decoration; U. S. Geological Survey, Mineral Resources*, annual.

Buitenzorg, boi'ten-zor*ch'*, (=*sans souci*, 'without care'), town, Java, located at a high altitude in the interior; 34 miles south of Batavia. Here the governor-general of the Dutch East Indies has his summer palace in the midst of beautifully laid out botanic gardens, said to be among the finest in the world. It is also a fashionable resort for all the island. It has a trade in coffee, rice and sugar. Pop. 46,700.

Bujalancé, bo͞o'Ha-län'tha, city, Spain, in Andalusia, 25 miles east of Cordova. It has manufactures of leather, woollen cloth and pottery. Pop. 12,000.

Bukhara. See Bokhara.

Bukharest. See Bucharest.

Bukkefjord. See Buknfjord.

Bujknfjord, bo͝ok'n-fyôr, a large fjord on the west coast of Norway, between Stavanger and Bergen, with numerous ramifications—*e.g.* Lysifjord, Sandsfjord, and Sandeidsfjord.

Bukowina, bo͞o-kō-vē'nä, or Bukovina, a division of Roumania, which stretches from the Dniester across the Pruth and Sereth, and up the eastern face of the Carpathians to the border line with Transylvania; area, 4,030 square miles. It is very mountainous, and almost one-half of the surface is covered with forests (beech, conifers, alder, etc.). The principal crop is maize. Much fruit is grown, especially in the valley of the Suczawa. Manganese and salt are the only minerals extracted. It contains many interesting and unique examples of art and architecture. There is a university at Czernowitz, the capital. Bukowina formerly was a crown land of Austria but was allotted to Roumania in 1918. During the war the Russians overran Bukowina in January 1915, but were subsequently compelled to evacuate it, owing to the general retreat of their armies in that year. It was recovered in June 1916. When Roumania entered the war the Russians established contact with the Roumanian troops in the southern Bukowina, where, on January 15, 1917, they defeated a German attempt to break through. Pop. 810,000.

Bulacan, bo͞o-lä-kän', province, Luzon, Philippine Islands, situated about the middle of the island, and bounded by Nueva Ecija, Infanta, Rizal, Manila Bay and Pampanga; area, 841 square miles. The Rio Grande de la Pampanga, one of the largest rivers in Luzon, forms the west boundary. Flat in general contour, with rivers draining to the west, the terrene rises abruptly at the Infanta border in the Cordillera Grande Oriental. The exuberant vegetation has won the province the name of 'the garden of the Philippines.' Rice, corn, sugar, indigo, beneseed, cacao, and coffee, are produced abundantly, and there are rich deposits of coal, copper, lead, silver and magnetic ores. Transportation facilities are excellent and include rail and wagon roads and navigable streams. Malolos, the capital, is 20 miles northwest of Manila.

Bulacan, pueblo, Luzon, Philippine Islands, in the province of Bulacan, 7 miles southeast of Malolos, on one of the 44 islands in the delta of the Pampanga Grande. River traffic is an important industry. Pop. 10,000.

Bulan, bo͞o'län, pueblo, Luzon, P. I., in Sorsogon province, on Bulan River and San Bernardino Strait, near the extreme southern end of the island; 25 miles southwest of Sorsogon. It is a port of call for coastwise steamers. Pop. 15,000.

Bulandshahr, bo͞o-l*a*nd-shä'-h'r, district of the Meerut division of the United Provinces, India, with an area of 1,908 square miles. It is an alluvial plain lying between the Ganges and the Jumna. The Ganges Canal passes through the district from north to south. Indigo is the main crop. Pop, 1,100,000.

Bulandshahr or Baran, town, India, capital of the district of Bulandshahr, 40 miles southeast of Delhi. It is a place of great antiquity. Pop. 20,000.

Bulb, an underground store of plant nutriment which in a dormant state shows no signs of roots, stems, or leaves, yet when placed under suitable conditions develops all these appendages. Tuber of dahlia, corm of crocus, rhizome of anemone, share with the true bulb of onion or tulip this general name. And functionally they all may be considered together, though morphologically the differences are considerable. In the onion or hyacinth, the area of storage becomes clearly marked off, and in autumn the vegetative portion of the leaf dies away, leaving the successive leaf-bases overlapping each other around the excessively shortened disk-like axis. In a true bulb, such as that of a tulip, almost the whole substance is composed of a series of overlapping fleshy scales. These are really modified leaves, and the little that remains when they are removed is a rudimentary stem to which they were attached. After the tulip has flowered, it accumulates fresh food material in a new bulb, formed by the development of a bud contained among the scales of the old and now withered bulb of the previous year.

A corm is composed of the swollen base of the stem, and not, as with true bulbs, of the leaves—the latter having degenerated into mere membranous sheaths, which have no function beyond serving as protective envelopes for the food-store and living nucleus within. The rhizome and tuber (qq. v.) show differences even more marked.

The use of the bulb to the plant, as affording at once a citadel of refuge during the severity of the winter of cold climates, or of the dry season of warmer ones, and a store of materials for a vigorous start in spring before the competition of other plants has become active, is obvious. The large nutritive store gives a proportional possibility of reproductive outlay, and the remarkable size and beauty, as well as the earliness of flowering of most bulbous plants, as the hyacinth, narcissus, and tulip, are thus explained.

In growing bulbous plants great care must be taken that no damage is done to the leaves when flowering is finished, for it is on the activity of these leaves that the next year's flowers depend. Bulb growing is a great Dutch industry, and bulbs are an important article of Dutch export. Consult Arnott's *The Book of Bulbs*.

Bulbar Paralysis. See PARALYSIS.

Bulbul, bo͝ol'bo͝ol, an Arabic word, much used in Persian poetry, though there is some dispute as to the bird to which it applies. Ornithologists apply the term to the members of the Indian and African family Pycnonotidæ, closely allied to the thrushes, but the true bulbul is probably the Persian nightingale (*Daulias hafizi*).

Buldana, bo͝ol-dä'nä, district, Berar, British India; area, 3,662 square miles. Agriculture and the manufacture of cotton cloth are the leading industries, and cotton, wheat, and oil seeds are exported. Pop. 425,000. ***Buldana***, the capital, has a population of 4,500.

Bul'finch, CHARLES (1763–1844), American architect, was born in Boston, Mass. He was graduated from Harvard in 1781, and spent some time (1785–7) in travel and study in France and Italy. He built the first theatre in New England, the old Federal Street Theatre, Boston (1793), and erected the famous State House in that city (1795–8), afterward greatly enlarged. In 1818 he was appointed to succeed B. H. Latrobe as architect of the Capitol in Washington, completing the original structure in 1830. He designed also University Hall, Cambridge (1814), the Connecticut State House (now the Hartford City Hall), and the Massachusetts General Hospital, and remodelled Faneuil Hall (q. v.). Consult *Life and Letters* by Ellen S. Bulfinch.

Bulfinch, THOMAS (1796–1867), American author, was born in Boston, Mass. He was graduated from Harvard, and devoted himself to mercantile pursuits until 1837, when he became connected with the Merchants' Bank of Boston. His books, which were written in the intervals of business, include *Hebrew Lyrical History* (1853), *The Age of Fable* (1855), *The Age of Chivalry* (1858), and *Oregon and Eldorado, or Romance of the Rivers* (1866). His *Age of Fable,* planned to popularize mythology, still remains a favorite.

Bulga'ria, a European kingdom, in the northeastern part of the Balkan Peninsula, created a principality by the Treaty of Berlin in 1878, greatly extended by the incorporation of Eastern Roumelia in 1885, and declared an independent tsardom in 1908. It has a total area (1919) of 43,300 square miles, and is bounded by Roumania on the north, by Servia on the west, by Greece and the Ægean Sea on the south, and by the Black Sea and former European Turkey on the east and southeast. (See Map of Balkan Peninsula.)

Topography.—The physical aspects of Bulgaria are varied, but the land is for the most part hilly, and the geology is largely that of the Balkans, which traverse the country from east to west. To the north of this great range is the fertile valley of the Danube, which for a considerable distance forms the boundary line between Bulgaria and Roumania; to the south, closely parallel with the main range, are the minor ranges of Sredna Gora and Karaja Dagh; in the southeast are the Rhodope mountains, culminating in the imposing summit of Muss Alla, over 9,600 feet in height, next to Mt. Olympus the loftiest peak in the Balkan Peninsula.

Numerous rivers traverse northern Bulgaria to join the Danube, notably the Lom, Ogust, Iskr, Vid, Osem, Yantra, and Eastern Lom. The Kamcyk, or Kamtchyk, flows directly from the Balkans into the Black Sea; the Maritza, with its tributaries the Tunja and Arda, traverses the wide plain of Eastern Roumelia and empties into the Ægean; while the Struma, rising about 20 miles south of Sofia, follows a southerly course and also comes to the Ægean.

Climate.—Bulgaria is in general characterized by rainy springs; hot, rainless summers; clear, fine autumns; and dry winters of great severity, especially north of the Balkans, where the temperature sometimes falls to 20° below zero. Local variations of temperature are extreme.

Natural Resources are abundant. Forests of fir, oak, beach, pine, willow and poplar cover about 30 per cent. of the surface, and there are valuable mineral deposits, though lack of capital has prevented the development of the mines to their fullest extent. Coal occurs in large quantities at Pernik and in the vicinity of Trevna, and lead, manganese, iron, gold, silver, salt, and copper have been discovered. Over 228,000 tons of stone were quarried in 1918, of which granite, marble, fireclay, and ochre formed the bulk. The province of Vratza abounds in hot springs, while Stara Zagora is known for its natural mineral waters. The soil of the country is exceedingly fertile and is adapted for the growing of the various European crops. Bears, wolves, buffalo, deer, lynx, and other wild animals inhabit the dense Bulgarian forests.

Agriculture and Stock Raising.—Agriculture is the principal occupation, engaging in normal times about five-sevenths of the population. The holdings are small—usually only a few acres, and the methods of cultivation are primitive. The chief crops are maize and wheat, the former product being raised principally for home consumption, the latter for export. Grapes are grown throughout the country, but the Bulgarian wines are usually of inferior quality. Tobacco is also cultivated both for home consumption and for export, and there are rice plantations in Philippopolis. Barley, oats, potatoes, rye, fruits, and garden vegetables are among other products of the soil. In 1917 7,200,000 acres were devoted to agriculture; while the 1916–17 harvest included wheat, 1,040,700 metric tons (1 metric ton = approximately 2,200 lbs.); rye, 215,650 metric tons; barley, 320,900 metric tons; oats, 107,000 metric tons.

An important industry, especially in Philippopolis, is the growing of mulberry trees for silkworm culture. About $2,000,000 worth of silk is annually produced, and more than 50,000 families depend for their livelihood on this work. Rose culture for the production of attar of roses is also of importance, especially in the Kezanlik and Karlovo valleys (see ATTAR OF ROSES).

The raising of sheep, goats, and cattle is an important occupation in the mountain districts. Poultry of various kinds are also raised, and large quantities of eggs are shipped to foreign countries.

Manufactures.—The manufacturing industry is still in its infancy, but is being greatly stimulated by government bonuses and special privileges. There are a number of large establishments devoted to the manufacture of textiles—wool, silk, and cotton—and several distilleries, sugar refineries, and cigarette factories.

Transportation.—Bulgarian railways and ports are in the hands of the state and are managed by the General Board of State Railroads. Over fourteen railroads traverse the country, the total railway mileage in 1916 being 1,824 miles. The chief ports are Varna and Burgas on the Black Sea, and Sistova, Vidin and Rustchuk on the Danube. Roads are poorly kept and are in constant need of repairs. Postal, telegraph, and telephone facilities are well developed.

Commerce.—The commerce of Bulgaria follows three main routes—the Black Sea, the Danube, and the mainland railway communication. In 1914, the year prior to Bulgaria's entrance into the Great War, the total value of foreign trade was approximately $79,183,000, of which $30,885,000 represented exports, and $48,298,000 represented imports. The chief articles of export and their approximate annual value under normal trade conditions are: cereals, $20,000,000; tobacco, $5,000,000; eggs, $2,000,000; attar of roses, $1,500,000; woolen goods, $1,250,000; cattle, $1,000,000; skins, $750,000; cocoons, $400,000. The principal imports are textiles, machinery, hides and skins, minerals and mineral oils, and fuel. Trade is chiefly with European countries and Turkey.

Population.—According to the official Census of 1910 the population of Bulgaria was 4,337,516, of which number 3,203,810 were Bulgarians; 488,010 Turks; 75,773 Roumanians; 63,487 Greeks; 98,004 Gipsies; 37,663 Jews; 3,863 Germans; and 3,275 Russians, beside 61,690 of other nationalities. The population in 1917 was estimated at 5,517,700. The large bulk of the people are peasants, who still preserve the dress and custom of several centuries back.

The chief towns, with their population in 1910, are Sofia, the capital, 102,812; Philippopolis, 47,981; Varna, 41,419; Rustchuk, 36,255; Sliven, 50,598; Plevna, 23,049; Shumla, 22,225.

The state religion is that of the Greek Orthodox Church, but the Bulgarian Church has not been included in the Orthodox Communion since 1870. Other faiths are tolerated, and there are over half a million Mohammedans (602,101 in 1910), particularly in the north and east, some Catholics (32,130), Jews (40,070), and Gregorian Armenians (12,270), and a few Protestants (6,252).

Education is free and nominally compulsory, and is supported by the state and municipalities or communes. In addition to elementary schools (4,589 in 1913–14) there are a number of high schools, lower middle schools, and special schools. There is a university at Sofia with faculties of history and philology, physics and mathematics, medicine, and law.

Government.—The government of Bulgaria is that of a constitutional hereditary monarchy. The executive power is vested in the king, assisted by a council of eight ministers responsible to the king and to the National Assembly. The Assembly, or *sobranje*, elected by universal manhood suffrage, is the law-making body, but all its measures require the royal assent. For administrative purposes the country is divided into districts, where local autonomy is practiced.

Military service is compulsory for all except Mohammedans, who pay an exemption tax.

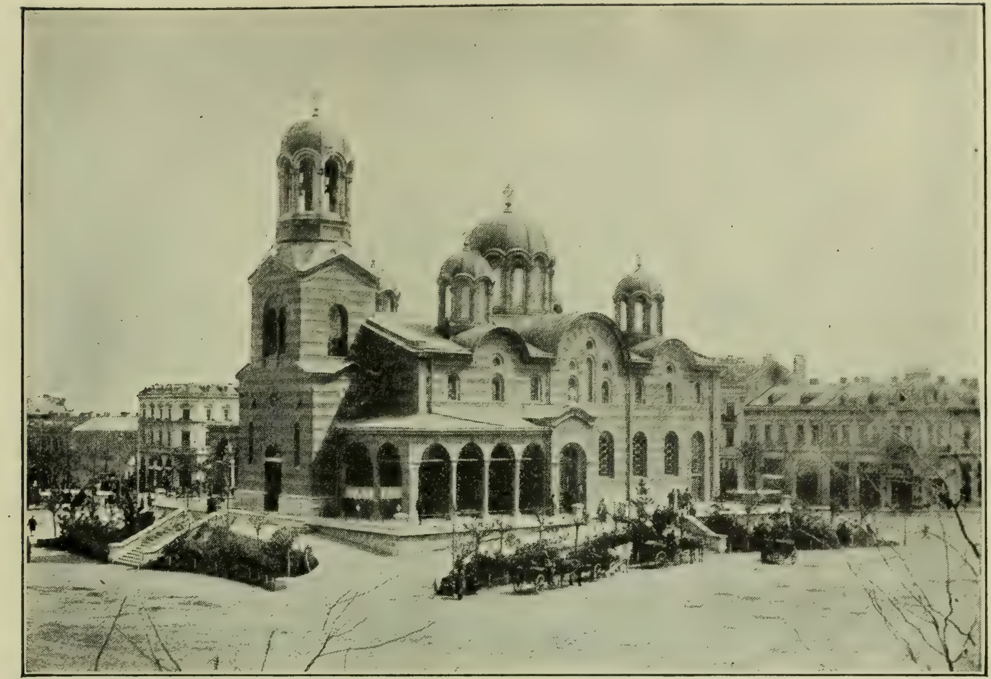
Finance.—The estimated revenues of Bulgaria for 1918, derived chiefly from taxes, were $93,700,000, and estimated expenditures $93,300,000. The consolidated debt on Dec. 1, 1917, amounted to about $21,500,000, and the floating debt to about $465,000,000, including a debt of some $82,670,000 to the Bulgarian National Bank. The monetary unit is the *leva*, worth $.19295 in American money.

History — The country now known as Bulgaria was originally inhabited by Thracians, and under the Romans formed the province of Mœsia. The Thracians disappeared before the great Slavonic immigration of the fourth and fifth centuries, and the Slavs were in turn overrun (seventh century) by the Bulgars, a Ugro-Finnish people, coming from the banks of the Volga, where the ruins of their ancient capital, Bolgary (q. v.) still stand. Though fewer in number, the Bulgars rapidly subjugated their Slav predecessors, adopted their language and customs, and at once absorbing and being absorbed, became a great Slav power. In 864 their prince, Boris, was baptized, and they became dependent on the patriarchate of Constantinople.

During the ninth and tenth centuries the Bulgarians reached the height of their power, dominating the greater part of the peninsula, including Macedonia, Thessaly, Epirus, and Albania. Their prince, Simeon, assumed the title of 'Autocrat or Tsar of all the Bulgarians and of the Greeks'; the Bulgarian archbishop was made an independent patriarch; and the Serbs and even the Byzantines paid Simeon tribute. At the end of the tenth century part of Eastern Bulgaria was incorporated with the Byzantine Empire, and in 1018 the Western Bulgarian kingdom became a Byzantine province. A third Bulgarian kingdom was formed in 1186 by a successful rebellion, and maintained itself against the emperors of Constantinople until the arrival of the Osmanli Turks, who defeated the Servians—the allies of Bulgaria—at the decisive battle of Kossovo in 1389, and four years later seized Tirnova, the Bulgarian capital. The conquerors severely repressed all signs of popular aspiration, and for several centuries the Bulgarians were practically forgotten as a nation.

The first national awakening dates from the year 1762, when the monk Paysios, then at Mt. Athos, wrote the national chronicles, and revived memories of ancient glory. A new national literature began; the first Bulgarian school was opened in 1835, and was followed by others. A newspaper appeared in 1844. The Crimean war stirred up Slavonic sympathies which Russia cherished, and in 1872 the Bulgarian Church and archbishop threw off the hated supremacy of the Greek patriarch, and assumed an autonomous church organization. Following the troubles in Bosnia (q. v.) and Herzegovina in 1875, two or three ill-organized local risings in Bulgaria, in 1876, were swiftly suppressed by Turkish troops. At the same time the Turkish population, aided by the Pomaks—*i.e.* Bulgarians who had adopted Mohammedanism—committed such excesses against the Christian population that over fifty villages were destroyed, and about 12,000 people were killed. These atrocities evoked great indignation in Europe, and led to the international conference at Constantinople (December, 1876), and to the Russo-Turkish War (1877-8). The Berlin Treaty (July 13, 1878) constituted Bulgaria north of the Balkans into an autonomous but tributary state, while Eastern Roumelia was granted administrative autonomy, and Macedonia was given to Turkey. The prince of Bulgaria, freely elected by the people, was to be confirmed by the Porte with the assent of the powers. The first choice of the Bulgarians was Prince Alexander of Battenberg, a cousin of the grand-duke of Hesse (see ALEXANDER I.).

In 1885 Eastern Roumelia was annexed to Bulgaria; in the same year the Servians were defeated at Silvnitza after a brief but spirited campaign; and in 1886 Alexander was forced by Russian hostility to abdicate. He was succeeded in 1887 by Prince Ferdinand of Coburg (see FERDINAND I.), who chose Stepan



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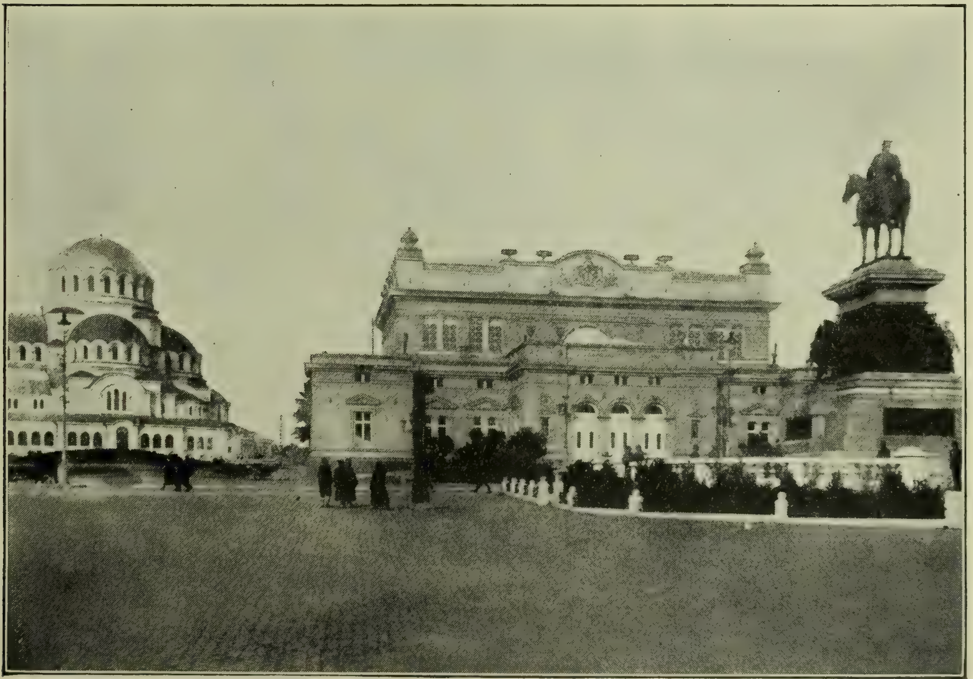
Cathedral at Sofia.



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Sofia, Capital of Bulgaria. On the left is the Church of St. Nicholas; in the centre the House of Parliament; on the right the Statue of a Former Tsar of Bulgaria.

VIEWS OF BULGARIA

Stambuloff (q. v.) as his minister, and under their administration the country made rapid progress. On Oct. 5, 1908, Ferdinand proclaimed Bulgaria an independent kingdom and himself assumed the title of tsar. In 1909 Turkey recognized Bulgaria's independence, and in 1911 the Crown Prince Boris was formally acknowledged as heir to the throne.

In 1912 Turkish oppression of the Bulgar-Serb communities in Macedonia led to the First Balkan War in which Bulgaria allied herself with Servia, Montenegro, and Greece against Turkey. The war came to an end with the Treaty of London (May, 1913), by which Turkey surrendered her claim to Crete and to all European territory west of a line from Midia on the Black Sea to Enos on the Ægean. Disputes over the division of the spoils prevented a lasting peace, however, and in a month's time the former allies were engaged in the Second Balkan war, Bulgaria having taken a stand against Greece, Servia, and Montenegro. Turkey and Roumania also entered the conflict, and Bulgaria was forced to accept peace terms by which she surrendered 2,000 square miles of her northeastern territory to Roumania, and received only 7,000 square miles on the south and west. (See Balkan Wars.)

The Great War (1914-18).—Bulgaria entered the Great War on the side of the Central Powers in the fall of 1915, after months of diplomatic interchanges. On Sept. 21, announcement was made that the Bulgarian army had been mobilized; on Oct. 11 Bulgarian forces crossed the Servian frontier; and on Oct. 14 Bulgaria declared war on Servia. Great Britain declared war on Bulgaria, Oct. 15, France on Oct. 18, Russia and Italy on Oct. 19. War was declared by Bulgaria on Roumania Aug. 31, 1916; and Greece declared war on Bulgaria July 2, 1917. Bulgarian forces played an important part in the conquest of Servia in the fall of 1915; they co-operated with the Germans in the Roumanian campaign of 1916–17; and a Bulgarian army invaded Macedonia in the summer of 1916.

On Sept. 18, 1918, the Allied armies began a powerful offensive in the Balkans which resulted in the unconditional surrender of Bulgaria and the signing of an armistice at Salonica, on Sept. 29, 1918. Three Bulgarian delegates represented Bulgaria, and Gen. Franchet D'Esperey (q.v.), Allied Commander-in-Chief in Macedonia, was the representative of the Allies. (See Europe, Great War of.)

On Oct. 4, 1918, King Ferdinand abdicated the throne in favor of his son, Crown Prince Boris.

Bibliography.—Consult G. Samuelson's *Bulgaria Past and Present;* H. Wood's *Danger Zone of Europe* (1911); W. Murray's *Making of a Balkan State* (1912); S. Guerin's *Histoire de la Bulgarie* (1913); L. Leger's *Serbes, Croates, and Bulgares* (1913); J. Macdonald's *Czar Ferdinand and His People* (1913); L. De Launay's *La Bulgarie d'hier and la demain* (1914); B. Rankin's *Inner History of the Balkan War* (1914); N. Forbe's *The Balkans* (1915); M. Newbigni's *Geographical Aspects of the Balkan Problems* (1915); E. Pear's *Forty Years in Constantinople* (1916); E. Daudet's *Ferdinand 1st Tzar de Bulgarie* (1917); J. Historicus' *Bulgaria and her Neighbors* (1917); L. Garnet's *Balkan Home Life* (1917).

Bulgarian Language, an inflected language belonging to the southeastern Slavonic branch of the Indo-European stock, closely allied with Russian. The ancient Bulgarian vernacular, called 'Old Church Slavonic' or 'Old Bulgarian,' is based on the Cyrillic alphabet (q. v.) invented by St. Cyril (see Cyril and Methodius), apostle of the Slavs. In the course of the centuries that language became greatly modified, and the Bulgarian speech of today bears but little resemblance to the original. Like the Russian, it lacks the syllabic quantity, and has neither inflection of nouns nor comparison of adjectives. Foreign words, from the Turkish, Servian, Russian, Greek, Romanic, Albanian, Italian, and Persian, abound; Turkish adjectives and substantives are used; and even strictly Slavic verbs are conjugated in a purely Turkish way. A large number of pure Slavonic words still exist, but their meaning has been totally changed in many cases. Thus, *pravit,* originally 'to say,' is translated 'to do'; *dumat,* originally 'to think,' now signifies 'to speak.' Two other features are particularly noteworthy: the placing of the article after the noun—thus, *kon* = 'a horse,' *konet* = 'the horse;' and the occurrence of the vowel û, which has its analogy only in Roumanian. The literary idiom differs markedly from that of conversation and song.

The modern literature (since 1762) is chiefly educational and popular and political. The poems of Slaviikov, the novels of Karavelov, the historical works of Drinov, deserve mention; there is also a rich lyrical popular poetry.

Consult Morse and Vasilief's *Grammar and Dictionary.*

Bulgarin, bo͞ol-gä'rin, Faddéi Vénediktovitch (1789–1859), Russian journalist and author, of Polish descent, was born in Lithuania. After serving in the Polish army under Napoleon, he established himself at St. Petersburg, and founded (1823) the *Northern Archive,* and in 1825 a new edition of the political daily the *Northern Bee.* He wrote several novels in the manner of Sir Walter Scott — *e. g. Ivan Vishigin, or the Russian Gil Blas* (1829; Eng. trans. as *Ivan Vejeeghen, or Life in Russia,* 1831); its continuation, *Peter Ivanovitch Vishigin* (1831); *Mazeppa* (1834), etc. He also published (in Russian) *Russia: an Historical, Geographical, and Literary Survey* (1837); and his *Memoirs* (1846–50).

Bulgars. See Bulgaria, *History.*

Bulkeley, bulk'li, Morgan Gardner (1837), American public official, was born in East Haddam, Conn. He served in the Union army, and on his father's death, in 1872, settled in Hartford and organized the U. S. bank, of which he was president until 1879, when he resigned to take the presidency of the Ætna Life Insurance Company. He filled local public offices, including four terms as mayor of Hartford (1880-88), was Republican governor of Connecticut (1889–93), and Republican U. S. Senator from the same State for the term 1905–11.

Bulkheads. (**1.**) *In tunnelling* and *excavating,* the vertical partitions of timbers or masonry to keep out water, air, or mud. Such structures may be solid, or provided with doors to give ingress and egress to workmen and materials. (**2.**) *In harbor work,* the sea-walls marking the shore-line. From them project piers and docks. (**3.**) *On shipboard,* steel partitions, both transverse and longitudinal, which divide a vessel into a number of water-tight compartments, and thus lessen the danger of foundering when the ship is breached. In men-of-war the bulkheads are provided with water-tight doors. In twin and triple screw ships each engine often is in a separate compartment, as are also the boilers and the coal-bunkers. *Collision bulkheads* are those nearest the bow and the stern.

Bulk'ley, L. Duncan (1845), American physician, was born in New York City. He was graduated from Yale (1866), and from the College of Physicians and Surgeons, Columbia University (1869), and studied dermatology in Vienna, Paris, and London. He became attending physician to the N. Y. Skin and Cancer Hospital (1882), consulting physician to the N. Y. Hospital (1894), and dermatologist to other New York institutions. Among his technical works are: *Acne and its Treatment* (1885); *Eczema and Its Management* (1911); *Compendium of Diseases*

Died July 20, 1928

of the Skin (1912); *Diet and Hygiene in Diseases of the Skin* (1913); *Cancer, Its Cause and Treatment* (vols. i and ii., 1915, 1917).

Bulkley, or **Bulkeley,** PETER (1583–1659), American colonial clergyman, was born in Odell, Bedfordshire, England. He was educated at St. John's College, Cambridge, of which he was for some time a fellow, was rector of Woodhill for twenty-one years, and, having through his noncomformity come into conflict with Archbishop Laud, emigrated to Cambridge, Mass., in 1635. In 1636 he was the principal founder of Concord, Mass., where he was pastor until his death. He published a series of sermons, *The Gospel Covenant, or the Covenant of Grace Opened* (1646), which, says Prof. M. C. Tyler, 'stands for the intellectual robustness of New England in the first age. It is an honor to that community of pioneers, drudging in the woods of Concord, that these profound and elaborate discourses could have been produced, and endured, among them.'

Bull, an instrument, ordinance, decree, or letter of the Pope. The word is derived from the Latin *bulla*, which means a bubble or capsule of wax enveloping a seal; later it was applied to the seal itself, and then to the document to which the seal gave authority. Down to 1878 papal bulls were written on parchment in antiquated Gothic script and in the Latin tongue, and had usually a leaden seal appended. By a *Motu proprio* of December 9, 1878, Leo XIII. ordained that the leaden seal should be employed henceforth only in case of bulls concerning collations, erections, and dismemberments of greater benefices (reserved to the Pope), and other solemn acts of the Holy See. In other bulls, 'especially those relating to ordinary benefices and marriage dispensations,' the old leaden seal is replaced by a red seal stamped on the parchment itself, while ordinary Latin current writing displaces the Gothic character.

Bulls are generally named from the first word or words. Some of the most celebrated are: *Clericis Laicos* (1296) and *Unam Sanctam* (1302), by Boniface VIII. against Philip the Fair of France; *In Cœna Domini* (1362), first issued by Urban V. against heretics; *Execrabilis* (1460), by Pius II., in which he proclaimed papal superiority over the councils; *Exsurge Domine* (1520), by Leo X. against Luther; *Unigenitus* (1713), by Clement XI., condemning one hundred and one Jansenistic propositions taken from the *Reflexiones morales* of Quesnel; *Dominus ac Redemptor noster* (1773), by Clement XIV., abolishing the Jesuit order, and *Sollicitudo Omnium* (1814), by Pius VII., for its re-establishment; *Ineffabilis* (1854), which contains the dogma of the Immaculate Conception, and *Pastor Æternus* (1870), which proclaims the infallibility of the Pope, by Pius IX.

A collection of bulls is called a *bullarium*. The best editions are those by Coquelines, continued by Barberi and Gaude, and the Turin *Bullarium* (26 vols., 1857–85). See BRIEF.

Bull, an unconscious and amusing blunder in speech, implying an evident contradiction in terms. A classical example was elicited by the Parnell Commission: 'Better be a coward for five minutes than be dead all the rest of your life.' Consult *Essay on Irish Bulls*, by R. L. Edgeworth and his daughter Maria.

Bull. See CATTLE.

Bull, CHARLES STEDMAN (1846–1911), American physician, was born in New York City. He was graduated from Columbia University (1864) and from the College of Physicians and Surgeons (1868), and continued his studies at the universities of Paris, Berlin, Vienna, Heidelberg, and Utrecht, and in the hospitals of London, devoting his attention chiefly to ophthalmology. He was surgeon to the N. Y. Eye and Ear Infirmary, professor of ophthalmology in the Cornell University Medical College, and consulting ophthalmic surgeon to various New York hospitals. He published a number of medical works, and edited, with original contributions, Wells' *Treatise on Diseases of the Eye*.

Bull, GEORGE (1634 – 1710), English bishop, was born at Wells, and studied at Exeter College, Oxford, whence he retired in 1649, having refused to take the commonwealth oath. Ordained in 1655, he took the small parish of St. George's, Bristol, and subsequently obtained the bishopric of St. David's (1705). He gained a great reputation, especially among continental theologians, by three books on the Trinity—*Defensio Fidei Nicœnœ* (1685), to prove that ante-Nicene fathers held the Nicene faith; *Judicium Ecclesiœ Catholicœ* (1694), to prove that the Nicene fathers accepted in its full sense the divinity of Jesus; and *Primitiva et Apostolica Traditio* (1710), to prove that the doctrines of Christ's pre-existence and incarnation were not inventions of early heretics. He published also *The Corruptions of the Church of Rome* (1705–07), in reply to Bossuet's query as to why he did not join the Roman Church. Consult Nelson's *Life of Bishop Bull.*

Bull, GOLDEN. See GOLDEN BULL.

Bull, JOHN, a generic name for the English people, and a personification of what is supposed to be the English type. It takes its origin from an amusing skit by John Arbuthnot, a contemporary of Swift, in his *History of John Bull* (1712). The figure now so familiar in cartoons was developed by the London *Punch*.

Bull, JOHN (?1563–1628), English musician, and first music lecturer in Gresham College, London, was born in Somersetshire. After a brilliant career in England he went to the Continent, where he became organist of the Cathedral of Notre Dame, Antwerp (1617). Bull's printed music is small in quantity, but there is a mass of it unpublished.

Bull, OLE BORNEMANN (1810–80), Norwegian violin virtuoso, was born in Bergen, Norway, and was sent to the University of Christiania by his father, a chemist, who intended him for the church. His connection with the university soon came to an end, however, and he devoted himself exclusively to music, having already studied the violin with Paulsen. He had a hard struggle at first, but was assisted by a lady of means, and receiving a considerable sum as the proceeds of his first concert in Paris (1833), given in company with Ernst and Chopin, he was enabled to make a musical tour of Italy, followed by similar tours in other countries of Europe, by which he acquired both wealth and fame.

Returning to his native town (1840) he bought an estate and remained there in retirement for three years. He visited the United States in 1843–5, meeting with his usual success in his concerts, and on his return to Bergen repeated his Continental triumph. He built a theatre for the presentation of Norse drama in Bergen, and undertook to establish Norwegian schools of letters and art, but his fortune was broken by lawsuits, and in 1852 he revisited the United States, where he bought a tract of land in Potter county, Pennsylvania, containing 120,000 acres, with the idea of founding a Norwegian colony, which was to be called 'Oleana.' A number of families settled upon it, but the title proved defective, and the plan came to an end. Bull subsequently married (1870) an American lady, his second wife, and lived partly in the United States and partly near Bergen until his death. He seldom performed other than his own compositions, but his playing was full of fire, poetry, and charm; he possessed a 'magnetic personality,' and rarely failed to rouse his audiences to enthusiasm. Consult *Memoir*, by Sara C. Bull.

Bull, WILLIAM TILLINGHAST (1849–1909), American surgeon, was born in Newport, R. I. He was graduated from Harvard

(1869) and from the College of Physicians and Surgeons, New York, and after studying in Europe, entered upon the practice of medicine in New York City. He was professor of surgery in the College of Physicians and Surgeons (1889–1909), and was known as one of the foremost surgeons in the United States, especially in cases of appendicitis and cancer. He eventually fell a victim to the latter disease.

Bul′la, a locket-like ornament worn by Etruscan and Roman children as an amulet, and laid aside at maturity. The name was also given to the seals used by the emperors of Constantinople and of the Holy Roman empire, and by the Pope. (See Bull.)

In *pathology*, a bulla is a small raised portion of the epidermis filled with watery fluid like a blister.

Bullace, bo͝ol′lās (*Prunus insititia*), a shrub or small tree, larger and much less spiny than the blackthorn (q. v.) or sloe, but very closely allied to it, as it is also to the plum, so that many botanists regard them as one species (see Plum). It is found chiefly in Great Britain and other European countries, but is rare in the United States.

For the Jamaica ***Bullace Plum,*** see Honeyberry.

Bull Baiting, an obsolete sport in which a bull, tied to a stake, and having the points of his horns guarded, was worried to death by dogs. In 1835 the sport was declared illegal in Great Britain.

Bulldog, a variety of dog, probably of English origin, derived from a cross between a mastiff and some other breed. It was used for many centuries for bull and bear baiting, but at present it is bred mainly as a pet and for show purposes. Although of surly disposition it must be thoroughly aroused before it will show its former activity and courage. It is not generally regarded as capable of strong attachment and is accounted of little value as a watch dog.

The average bulldog weighs from 40 to 50 pounds. The points are as follows: Thickset and compact in build; very heavy in front and comparatively light behind; legs strong and short, muscular, and set outside the body; shoulders massive, and standing well out; chest wide and deep; skull large; temples high, with stop well defined; eyes wide apart and black; under jaw wide, projecting, and turned upwards; face short and deeply wrinkled; nose large and black; ears folding over at back showing the underside; bottom teeth projecting at least half an inch in advance of top ones; a good dewlap; back short and roached; ribs well sprung; fine loin, well tucked up; tail short, kinked, and set on low; coat fine and smooth; action rather slovenly, the hind legs not being lifted high, and the body having a peculiar characteristic swing. The accepted colors are brindle, fawn, red, and solid white, or white pied.

The *French Bulldog* is a small compactly built dog, differing from the English variety chiefly in size and in its erect bat-like ears, which give it a singularly alert appearance. *Toy Bulldogs* are small breeds, usually weighing less than 22 pounds, but conforming in other points to the standards for the larger dog. The *Bull Terrier*, of which the so called Boston Bull or Boston Terrier is a familiar example, is the result of a cross between the bulldog and the smooth terrier. It is intelligent, agile, and of great courage. Consult Cooper and Browne's *Bulldogs* (1914).

Bull′en, Frank Thomas (1857–1915), English writer on sea life, was born at Paddington, London. He had but little schooling and was at sea from 1859 to 1883, visiting many parts of the world. From 1883 to 1899 he was engaged as clerk in the British Meteorological Office. His works include *The Cruise of the 'Cachalot,'* with introduction by Kipling (1898); *Idylls of the Sea* (1899); *The Log of a Sea Waif* (1899); *Men of the Merchant Service* (1900); *With Christ at Sea* (1900); *Deep-sea Plunderings* (1901); *A Whaleman's Wife* (1902); *A Sailor Apostle* (1903); *Sea-Wrack* (1903); *Creatures of the Sea* (1905); *Told in the Dog Watch* (1910); *From Wheel and Outlook* (1913).

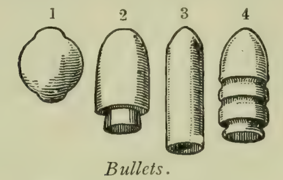
Bul′ler, Charles (1806–48), British lawyer and politician, was born in Calcutta. He studied at Harrow and Cambridge, and was a private pupil of Thomas Carlyle. He practised chiefly in Indian and colonial appeals; was interested in reforms of parliamentary procedure and of the poor law; and originated the Record Commission. He was secretary (1838) to Lord Durham when the latter was governor-general of Canada, and along with Wakefield drew up the famous *Report on the Affairs of British North America*.

Buller, Sir Redvers Henry (1839–1908), English general, was born near Crediton, Devonshire. He served in China (1860), in the Red River expedition (1870), and in the Ashanti War (1874), and in the Kaffir and Zulu wars of 1878–9, in which he came to the front as a soldier of exceptional resource and daring. In the Boer War of 1881 he served as chief of staff to Sir Evelyn Wood. In 1882 he was head of the intelligence department in the Egyptian campaign, for his services in which he was knighted, and in 1884-5 he was chief of staff in the Sudan. He was appointed quartermaster-general in 1887, was for a short time under-secretary for Ireland, and from 1890 to 1897 acted as adjutant-general. He took part in the South African War (1899-1900), first as general commanding the forces in South Africa, and afterward as general officer commanding in Natal. He conducted the operations for the relief of Ladysmith, which, after three unsuccessful attempts, was effected following an investment of 118 days. He was subsequently engaged in the expulsion of the Boers from Natal; but was superseded by General Roberts. In 1901 General Buller retired to Aldershot, where, in 1898, he had been appointed commander of the First Army Corps, but he was soon called upon to resign his command (1901) owing to an indiscreet speech. Investigations concerning Buller's career in South Africa disclosed facts very damaging to his reputation as a commander. Consult Butler's *Life* (1909).

Bullet, the solid projectile discharged from any kind of small-arm. Formerly all bullets were spherical, and cast in molds. Now all rifle bullets are elongated, and cut by machinery from rods of lead. The expanding or dilating action of a bullet has been claimed by many inventors; but the British government in 1857 awarded the English gunmaker Greener $5,000, as the person who had practically solved the difficulty as far back as 1836. In 1841 Delvigne, a French officer, invented the first elongated cylindro-conoidal bullet with a hollow base, which was expanded by the explosion of the charge so that the lead entered the grooves of the rifle. Thus the great difficulty in muzzle-loading with a bullet of almost the same diameter as that of the barrel was avoided. The use of an elongated bullet also allowed the diameter of the bore of the rifle to be diminished without necessarily decreasing the weight of the bullet. Captain Minié in 1847 assisted the expansion of the base by iron plugs or cups fitting into the hollow, and driven into it by the explosion of the charge, and Minié balls were largely used in the Civil war.

Some of the early elongated bullets had cannelures, or sharp-edged grooves, cut in rings outside the cylindrical base, the object of which was to assist in retaining the bullet in its course, the resistance of the air acting on one side of it whenever the bullet deflected from its course, and thus turning the point back to the original direction. All these bullets for large-bore rifles were of lead, latterly slightly hardened with tin.

When small-bore rifles were adopted, the diameter of the bullet was necessarily much reduced. Although its weight was diminished, it was still necessary for its efficiency that it should not be too light. It had therefore to be made much longer proportionately to its diameter than the old bullet. It is absolutely essential to the accuracy in direction of an elongated projectile that it should fly point foremost, and the rotation imparted to it by the rifling of the barrel prevents its turning over during its flight. The longer the bullet in proportion to its diameter, the more rotation it requires to keep it in position. This is why the grooving of the small-bore rifle has a far more rapid twist than had that of the large bore. The rifling of the modern small arms makes one turn in about 8 inches. (See Rifle.) But a bullet of so soft a metal as lead, treated to this rapid rotation in the bore of a rifle, would issue from it a shapeless mass, and fly quite inaccurately; therefore the modern bullet has a casing of hard metal (usually cupro-nickel) covering a core of antimonious lead. This hard metal envelope cannot be expanded by the explosion of the charge, and accordingly the small-bore bullet has no cavity in the base. To force it to take the grooves, it is made to cut its way into them by giving the bullet a slightly larger diameter than that of the barrel through which it will have to travel.



Bullets.

1. Belted. 2. Greener. 3. Delvigne. 4. Minié ball.

The bullet for the Springfield rifle, model 1903 (calibre .300 in.), at present in use in the U. S. army, has a diameter of .308 in. It weighs 150 grains, is 1¼ in. long, and composed of 1 part tin to 25 parts lead, covered with a jacket of cupro-nickel. The powder charge for this bullet is 48–50 grains, which gives it a muzzle velocity of 2,700 feet per second, and a pressure in the chamber of 49,000 pounds per square inch. For the prohibition of explosive and expansive bullets, see Hague Convention.

Bull-fighting is the national sport of Spain, but has been introduced into France, where, in spite of the prohibitive laws of the country, it has taken a great hold on the people. The bulls used in Spain are bred upon the plain between the sierras and the marshy coast-land of the south. The choosing of suitable animals from a large herd is considered excellent sport and by many Englishmen is preferred to the amphitheatre performance; agility and courage are required in the highest degree. The owners ride to the grazing ground with their friends and several *novilleros*, or apprentice fighters. The *novilleros* tease the young bulls (*novillos*), and ward off dangerous rushes by long lances with blunt points. On the occasion of a bull-fight the processional entry into the arena is one of the chief attractions. In the front rank walk three *matadors*, who are the principal actors in the show. Then come the *banderilleros*, whose task it is to infuriate the bull by planting darts (*banderillos*) in his shoulders. The *picadores*, mounted on worn-out horses and armed with lances, follow. Last of all come the *monosasabios*, attendants who lead spare horses with bright-colored saddles. The procession passes across the arena and salutes the mayor. Then the *picadores* move off with their horses, the *banderilleros* shake out their red and yellow capes, and the arena fills with attendants in blue overalls, vermilion shirts, and red hats with blue knobs. All these supers carry sticks, with which to urge on the horses when they show signs of falling.

Directly the bull is let into the arena, a *banderillero* runs up to it and flourishes a cape before its eyes. He then runs toward the railing, the bull at his heels, and the fight commences. The *banderilleros* throw their bright-colored darts, with streamers attached, into the animal's neck. When this has gone on for some time, and the bull is half mad with pain and rage, the *matador* salutes the mayor. He wears a pigtail and carries a bright vermilion cloth, called the *muleta*, and a sword. Then ensue the most exciting moments of the fight, ending with the death of the bull at the hands of the *matador*.

The popularity of these *matadors*, or chiefs of the ring, is remarkable. Kings are not cheered more loudly than they. One of the most popular *matadors* was Rafael Guerra, commonly known as Guerrita, who retired with an enormous fortune. He was probably the greatest bull-fighter of any time; his chief rival was Manuel Espartero, who was killed in the bull-ring of Madrid.

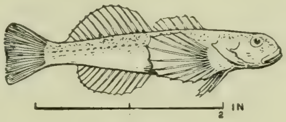
The first bull-fight in Paris took place on Oct. 8, 1899. See Degado's *La Tauromachia* (1894); Hoot's *Les Courses de Taureaux à Paris* (1890).

Bullfinch (*Pyrrhula europœa*), a common and handsome bird, with a red breast, coal-black head and quills, and gray back. It is readily tamed, and is often kept in confinement for its singing, in which it is capable of learning tunes.

Bullfrog. The largest of N. American frogs (*Rana catesbiana*), sometimes 8 inches in length. It is green, mottled with brownish, and inhabits warm, sluggish streams and marshes everywhere east of the Plains, preying upon smaller frogs, little fishes and aquatic animals generally. It is especially numerous along the margins of the Great Lakes, where thousands are annually killed and sent to city markets, the large hind legs, when suitably prepared, forming a delicacy highly esteemed. See Frog.

Bullhead, or Bullpout. In the United States any of the small catfish of warm, sluggish streams, especially the little, long-horned *Amiurus nebulosus* of the Eastern states, one of the fishes most easily and often caught by young anglers. It is not often eaten; but having been introduced into central California rivers, has there become a much larger and finer fish, locally called 'Sacramento cat,' which is popular for the table. See Catfish.

In Great Britain this name is given to various species of the family Cattidæ, also called 'miller's thumbs.' These are small fresh-water or littoral bony fishes, common in the north temperate zone. The head is broad, depressed, and armed with spines; as in many shallow-water fish, scales are absent. The common marine species, *C. bubalis* and *C scorpius*, are typical littoral fish, to be found in every pool. The fersh-water *C. gobio* is stated to be sometimes used as food.



Bullhead.

Bullinger, Heinrich (1504–75), Swiss reformer, was born at Bremgarten; became Protestant pastor of Bremgarten in 1529, and of Zürich (1531) in succession to Zwingli, of whose followers he became leader in their struggle against Catholics and Lutherans. He assisted in drawing up the first Helvetic confession of faith at Basel in 1536. With Calvin and Farel he drew up an agreement on the subject of the Lord's Supper between the churches of Geneva and Zürich. He wrote numerous volumes of sermons.

in high repute in England, and published at Cambridge by the Parker Society; a *Life of Zwingli* (1535); and *Reformationsgeschichte* (6 vols. 1838–40). See *Life* by Pestalozzi (1858) and Christoffel (1875).

Bullion, uncoined gold and silver in bars or other masses; the word is also used to distinguish metallic from paper money, and occasionally means coin not allowed to pass, or not current at the place where it is tendered. The word was originally applied to the mint, or the place where precious metals were alloyed and converted into stamped money; derived from the Latin *bulla*, 'a lead stamp.'

Bullock, RUFUS BROWN (1834–1907), Amer. political leader, b. at Bethlehem, N. Y. He was for some time a telegraph operator, conspicuous for his skill, and became the representative of the Adams Express Co. in Georgia. Though he opposed secession, he adhered to the Confederacy during the Civil War, and during the Reconstruction period was a leader of the Republicans of Georgia. He was a member of the Constitutional Convention of 1868, and was governor of Georgia (1868–70), his administration meeting with much criticism. 'Party lines in the state had been so affected by the governor's conduct of affairs,' says Prof. Dunning, that the only division playing an important rôle was that into 'Bullock men' and 'anti-Bullock men.' Bullock subsequently became a leading business man in Atlanta.

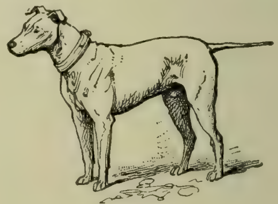
Bullock, WILLIAM A. (1813–67), American inventor, was born at Greenville, N. Y., and studied mechanics while working as an iron-founder. He had invented presses for cotton and hay when, in 1849, he started a paper, the *Banner of the Union*, at Philadelphia, removing it to Catskill, N. Y., in 1852. There he constructed a wooden press, turned by a hand-crank and fed by a machine, which was the basis of the self-feeding apparatus subsequently invented by him. Before he met his death by an accident while setting up one of his presses, he had devised a self-feeding, perfecting press capable of delivering 12,000 folded papers an hour.

Bull Run, FIRST BATTLE OF, a battle of the American Civil War, fought near Bull Run, a small stream in north-eastern Virginia, flowing into Occoquan R. (an affluent of the Potomac R.) on July 21, 1861, between a Confederate force of about 30,000 (including reinforcements which arrived during the battle) under Gen. Beauregard and Gen. Joseph E. Johnston, and a Federal force of about 29,000 under Gen. McDowell, the latter being decisively defeated. It was the first large battle of the conflict, and both armies were made up for the most part of raw troops, inexperienced in war. McDowell, the aggressor, had wished to delay his movement into Va. until his army should have become better organized, but was impelled forward by his government and by public sentiment in the North. He and Beauregard, by a singular coincidence, had adopted the same plan of battle, each deciding to turn the other's left. McDowell was first in delivering his attack, and for some time the strengthened Federal right prevailed over the weakened Confederate left, 'Stonewall' Jackson, however, standing firm and here earning his sobriquet; but, when a Federal victory seemed assured, a part of Johnston's army, which Gen. Patterson had bunglingly allowed to elude him in the Shenandoah Valley, arrived upon the field, the tables were quickly turned, and finally the Federals were forced, in a wild, disorderly retreat, back upon Washington. The loss of the Federals in killed and wounded was about 2,900; that of the Confederates about 1,700. The battle greatly inspirited the South and at first deeply discouraged the North, which, however, devoted itself with renewed vigor and determination to preparation for what, as then became apparent, would probably be a long and severe struggle. The defeat undoubtedly greatly injured the Federal cause in England, where 'the division of the Union,' wrote Adams, the U. S. minister at London, 'is now regarded as a *fait accompli*.' By the Confederates the battle was called the first battle of Manassas—Manassas being the name of a railway junction near the battlefield. See Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (4 v., 1887); Ropes, *Story of the Civil War* (2 v., 1894–8); and Nicolay and Hay, *Abraham Lincoln: a History* (10 v., 1890).

Bull Run, SECOND BATTLE OF, a battle of the American Civil War, fought on nearly the same field as the first battle of the same name, on Aug. 29 and 30, 1862, between about 49,000 Confederates under Gen. Robert E. Lee and about 70,000 Federals under Gen. Pope, the latter being defeated. The Confederate army was well organized and disciplined, and fought as a unit; the Federal army was really made up of parts of three armies, and, according to Ropes, was not truly an army but rather 'an aggregation of troops.' Moreover, the Confederates were greatly superior in leadership, Lee being an over-match for Pope, and Lee's two corps commanders, Jackson and Longstreet, giving him more efficient support than Pope's corps commanders, of whom McDowell was the foremost, gave to him. Pope, having blunderingly allowed Longstreet to reinforce Jackson (against whom Pope was moving) through Thoroughfare Gap, attacked on the 29th, ignorant of Longstreet's arrival on the field, and though Porter, blocked by Longstreet, was unable to deliver his attack in pursuance of Pope's orders, on Jackson's right, the Federals on the whole had the better of the day's fighting, which is sometimes known as the battle of Groveton. On the following day Pope renewed the attack, but was repulsed, and Lee, taking the offensive, drove the Federals from the field. The Federal loss in killed and wounded was about 14,500; that of the Confederates about 9,500. Out of Porter's conduct on the 29th arose the famous 'Fitz John Porter Case.' By the Confederates the battle was called the second battle of Manassas. See references under title BULL RUN, FIRST BATTLE OF; and in addition Cox, *The Second Battle of Bull Run* (1882).

Bulls and Bears. See STOCK EXCHANGE.

Bull-terrier. A dog of English origin, whose breeding has been carried to great perfection. It has great courage, and delights in fighting vermin; but to its master is of a gentle temperament, and this has made it a favorite everywhere. The average weight of the original type was about 35 lbs., but the fancier has evolved the toy variety, and there are now show classes for under 7 lbs., 7 lbs. to 10 lbs., 10 lbs. to 30 lbs., and over 30 lbs. Points—Head long and wedge-shaped, level as possible from skull to head of nose; jaw strong; mouth level; eyes small, dark, and not too prominent; chest broad; body short and well ribbed up; fore legs medium length, showing plenty of bone and muscle; feet strong and well arched; hind legs well hocked; tail fine and straight, carried in line with back when not



Bull-terrier.

excited (if excited, game dogs will get them up); coat fine, short, and smooth. As to color, pure white, with a black nose or eye, is most approved; but red, fawn, blue, brindle, and pied colors allowed, although they stand little chance in competition.

Bull Trout, or GRAY TROUT (*Salmo cambricus*), a fish allied to the salmon, common in many British waters. Its flesh is somewhat coarser, and as it is a bad riser to the fly, it is not so much prized by anglers. The name is also given to other related fish, as, in the Rocky Mountains, to the Dolly-Varden trout.

Bull Trout.

Bulnes, MANUEL (1799-1866), Chilian soldier, was born in Concepcion, and at sixteen was active in the movement for Chilian independence. He served in the Chilian army through the revolution of 1818-21, afterward suppressed disorders among the Indians, and in 1838 fought successfully against Peru, capturing Lima, and defeating Santa Cruz in several battles. He was made lieutenant-general, and was elected president of Chile in 1841, and re-elected in 1846. Many public institutions were established during his presidency.

Bülow, BABETTE VON. See ARNOLD, HANS.

Bülow, BERNHARD HENRY MARTIN CHARLES, PRINCE VON (1849), imperial chancellor of the German empire, was born at Klein Flottbeck, Holstein. In 1873 he entered the diplomatic service, and in 1878 was secretary of the Berlin Congress. He was successively first secretary of the embassy at Paris (1880) and at St. Petersburg (1883), minister at Bucharest (1888), and ambassador at Rome (1893-7), when he was appointed foreign secretary. He was made count in 1899, after the acquisition of the Caroline and Marianne Islands. In 1900 he was made chancellor of the German empire and Prime Minister of Prussia, succeeding Prince Hohenlohe. He resigned in July, 1909, upon the rejection of several government bills by the Reichstag, and permanently settled in Italy.

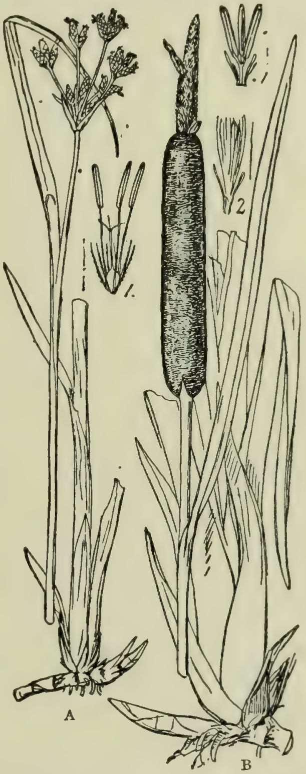
Bülow, FRIEDRICH WILHELM, COUNT VON (1755-1816), Prussian general, served with distinction in the campaign of the Rhine; fought with Blücher at Eylau and Friedland; and in 1813 defeated the French at Möckern, saved Berlin, and routed Marshal Ney at Dennewitz—which gained him the title of Count of Dennewitz. He was engaged in the battles of Leipzig and Soissons, and on the conclusion of peace became governor of Lithuania and E. Prussia. At Waterloo he was in command of Blücher's division, which saved the day. He then returned to his post in Lithuania, where he died. See *Life,* in German, by Varnhagen von Ense (1854).

Bülow, HANS GUIDO VON (1830-94), German pianist and conductor, born at Dresden; adopted the theories of Wagner, under whose guidance he placed himself, and, having completed his training under Liszt, made his first concert tour in 1853. From 1855 to 1864 he was principal pianoforte teacher at the Stern Conservatorium, Berlin, and in 1864 became conductor of the royal opera and director of the Conservatorium at Munich, where he organized model performances of Wagner's works. After 1869, when he left Munich, he held appointments as conductor at Hanover, Meiningen, St. Petersburg, Hamburg, and elsewhere. He made two concert tours to the U. S., the first in 1875-6, and again in 1889-90. With some eccentricities both as a man and a musician, he was a splendid interpreter of the pianoforte classics, and was eminently successful as a conductor. His memory was extraordinary, and he was the first to set the fashion of conducting without book. His editions of Beethoven and other masters of the pianoforte are of high value.

Bulrush. The true bulrush (*Scirpus lacustris*) is European. An American species is very like and found in the Western states, where it is known as tule, and is a valuable fibre and food plant for the aborigines, occurring in streams, ponds, and occasionally in boggy ground, its spiked inflorescence of reddish-brown flowers appearing in late summer. The plant is four feet or more in height, the stems are terete, and the leaves are flat or ribbon-shaped. The entire stem is used for mattings, basketry and various other purposes, as for the centre of the rush-light. The cat-tail (*Typha latifolia*) is often called the bulrush. The stem of this handsome plant is often seven feet in height, and in July culminates in a brownish cylinder of pistillate flowers, this again being crowned with a thin spike of male flowers. The thin, long leaves are used in cooperage to fill open seams; and to make chair-bottoms, thatching, matting and even boats. It is good for paper-stock. The soft down is sometimes used for upholstery stuffing.

Bulsar, seapt. tn. in Surat dist., 115 m. N.E. of Bombay, India, with an export trade in timber. Pop. (1901) 12,857.

Bulthaupt, HEINRICH (1849), German poet and dramatist, born at Bremen, where he became (1879) librarian of the municipal library. He belongs to the school of German poets who aim at the special cultivation of form; and among his more notable works are the dramas, *Die Arbeiter* (1876), *Eine neue Welt* (1886), *Der Verlorene Sohn* (1889), and a volume of poems, *Durch Frost und Gluten* (3rd ed. 1900). He has gained great renown by his *Dramaturgie des Schauspiels* (4 vols. 1901, several eds.), *Dramaturgie der Oper* (2 vols. 1887), and *Shakespeare und der Naturalismus* (1893).



A. *Bulrush* (1, *flower*). B. *Great reed-mace* (1, *male flower;* 2, *female*).

Bulti. See BALTISTAN.

Buluwayo, or BULAWAYO ('the place of killing'), in Rhodesia, S. Africa, formerly the kraal of Lobengula, king of the Matabele, now a British town and centre of trade. The present town lies on the open veldt, 1,361 m. from Cape Town, 272 m. from Salisbury, and has a white population of about 4,000. It is connected with Cape Town and Beira *viâ* Salisbury by railway and telegraph, and with the Wankie coal field and the Zambezi at Victoria Falls. The railway is being extended (1906) through N.E. Rhodesia to Abercorn, and thence to Lake Nyasa. The transcontinental telegraph now connects it with Ujiji, on Lake Tanganyika.

Bulwer, William Henry Lytton Earle, Baron Dalling and Bulwer (1801–72), English diplomatist, known as Sir Henry Bulwer, and elder brother of Lord Lytton, was born in London. He sat in Parliament for Wilton (1830), Coventry (1831), and Marylebone (1835). For the next thirty years he devoted himself entirely to diplomacy at Constantinople, Paris, Madrid (which he was ordered to quit by Narvaez for his supposed share in conspiracies), and in the U. S., when in 1849 and 1852 he was minister at Washington, where, in 1850, he negotiated the Bulwer-Clayton treaty. After serving as envoy extraordinary to Tuscany (1852–5), he was again accredited to Constantinople in 1857, and remained there till 1865. In 1868 he was elected member for Tamworth, and retained that seat until his elevation to the peerage (1871). Bulwer was very popular, had a great reputation as a diplomatist, and achieved some distinction as the author of two volumes (1867–70) of *Historical Characters* (Talleyrand, Cobbett, Canning, and Mackintosh), and a *Life of Viscount Palmerston* (1870).

Bulwer-Lytton, Sir Edward. See Lytton.

Bumblebee, or Humblebee. See Bee.

Bumboat, a wide, flat boat used in Holland. The name is also applied to the boats of small traders (often women) who sell provisions, clothing, etc., to vessels lying in roadsteads.

Bumpus, Hermon Carey (1862), American educator, was born at Buckfield, Me., and graduated (1884) at Brown University. He was professor of biology at Olivet College (1886–9), fellow of Clark University (1889–90), and held associate and full professorships at Brown University (1890–1901), for a portion of this time acting as director of the U. S. Biological Laboratory at Wood's Hole, Mass. In 1902 Dr. Bumpus was made director of the American Museum of Natural History in New York. He published *A Laboratory Course in Invertebrate Zoology* (1893) and numerous papers on biological subjects in scientific periodicals.

Bunce, Francis Marvin (1836–1901), American naval officer, born at Hartford, Conn. He graduated at the U. S. Naval Academy in 1857, became a lieutenant in 1861 and a lieutenant-commander in Jan., 1863, and during the Civil War served successively on the *Penobscot* (North Atlantic Blockading Squadron), and the *Pawnee* and *Catskill* (South Atlantic Squadron), and took part in various operations against the Charleston (S. C.) defences. In 1865–6 he took the monitor *Monadnock* on a special cruise from Philadelphia to San Francisco. He became a captain in 1883, a commodore in 1895, and a rear-admiral in 1898; commanded the North Atlantic Station (1895–7) and the New York Navy Yard (1897–8); and in 1898 retired from the active service.

Bunce, Oliver Bell (1828–90), American author, was born in New York city, and engaged for some years in the bookselling and publishing business in that city. He was subsequently literary adviser to the publishing house of D. Appleton & Co., and was editor of *Appleton's Journal* until the suspension of that periodical. His books include *A Bachelor's Story* (1859), *Bachelor Bluff, His Opinions, Sentiments, and Disputations* (1882), *My House, an Ideal* (1885), and a small book on manners, entitled *Don't* (1884), which reached a sale of 100,000 copies in America alone. Mr. Bunce originated and edited the work known as *Picturesque America*.

Buncombe, empty speech-making, tall-talk oratory intended to gull rather than to enlighten. The word is derived from Buncombe, a county of N. C. Near the close of a debate on the Missouri question in the 16th Congress, the representative from the district containing Buncombe co., insisted on inflicting a long speech on a dwindling house, saying, apologetically, that he was 'speaking for Buncombe.'

Bundelkhand, a tract of country in Central India, lying between the Jumna and Chambal. Area, 10,322 sq. m. The country is very fertile. It possesses deposits of iron ore, diamonds, and copper. Pop. (1901) 1,309,323.

Bunder or **Bandar Abbas.** See Bender Abbas.

Bundesrat, the federal council of the German empire, consisting of fifty-eight delegates appointed by the governments of the individual states for each session. In conjunction with the Reichstag it exercises legislative functions, and though mainly a confirming body, it may reject measures passed by the Reichstag, and has limited initiatory powers. Members may appear and speak in the Reichstag on matters directly connected with their states, but are not eligible for election to that body.

Bundheim. See Harzburg.

Bundi, feudatory state in Rajputana, India. Area, 2,220 sq. m. Pop. (1901) 171,227.—Bundi, the chief town, is 95 m. s. e. of Ajmere. Pop. (1901) 19,313.

Bunion, a swelling, generally of the bursa, at the base of the great toe. Gout, or the rheumatic constitution, may predispose to it; but the exciting cause is always ill-fitting foot-gear. causing abnormal pressure on the joint. Chronic inflammation is set up, and perhaps a false bursa is formed over the joint. In bad cases the tendon of the muscle which extends the great toe may be displaced. The bones are thickened by chronic inflammation, and the joint may become disorganized, with suppuration. The trouble is more common with women than with men. Soothing lotions may be used, and iodine painted over the enlargement of the joint later. In bad chronic cases the remedy recommended is excision of the head of the metatarsal bone.

Bunker Hill, Battle of, a battle fought chiefly on Breed's Hill, Charlestown, Mass., on June 17, 1775, during the American Revolution, between about 1,500 Americans entrenched, under Prescott and Putnam, and an attacking force of about 2,500 British under Sir William Howe, the Americans, after repelling two attacks and exhausting their supply of powder, being driven from their position, which they had occupied and fortified during the preceding night. The British loss in killed and wounded was about 1,050, the American about 450. The British plan of operations, by a frontal attack rather than by an occupation of the neck of the Charlestown isthmus and of Bunker Hill, which dominated Breed's Hill, has been regarded by military critics as a great blunder. This engagement, the first pitched battle of the Revolution, showed how well the Americans could fight even when pitted against regulars. Bunker Hill Monument, a granite obelisk 221 ft. in height (1825–43), stands on Breed's Hill, which is now known as Bunker Hill. At the laying of the corner-stone Webster delivered his famous Bunker Hill oration. He also spoke at the dedication. See Frothingham, *Siege of Boston* (1849), Ellis, *History of the Battle of Bunker's (Breed's) Hill* (1875), and Carrington, *Battles of the American Revolution* (last ed. 1904).

Bunner, Henry Cuyler (1855–96), American author, was born in Oswego, N. Y. After working as a reporter, he was in 1877 made assistant editor of *Puck* on its establishment, and shortly after he became editor, holding the position until his death. He published *A Woman of Honor* (1883), *Airs from Arcady and Elsewhere*, verse (1884), *The Story of a New York House* (1887), *Short Sixes* (1894), and *Jersey Street and Jersey Lane* (1896). *In Partnership* (1884) was a collection of stories by Bunner and Brander Matthews. His play, *The Tower of Babel*, written in collaboration with Julian Magnus, was produced at Philadelphia in 1883.

Bunsen, Christian Charles Josias, Baron von (1791–1860), German diplomatist and scholar, was born at Korbach, Waldeck. After spending some years (1818–27) as secretary to the Prussian embassy in Rome, he was appointed ambassador there in 1827, and filled this office until his recall in 1838. After serving a short time as ambassador at Berne (1839–41), he was appointed to the corresponding post in England, where he remained for the rest of his official life. On questions of church organization he did not always agree with the king of Prussia, and he formulated his views in *Die Verfassung der Kirche der Zukunft* (1845). Appointed commissioner to settle the dispute with Denmark about Schleswig-Holstein, he in 1848 presented to Lord Palmerston a *Memoir on the Constitutional Rights of the Duchies of Schleswig and Holstein;* but his views were not accepted by the British premier. The outbreak of the Crimean War led to his recall (1854). Although he retired into private life, his *Zeichen der Zeit* (1855) showed that he still took a deep interest in political affairs. See the *Memoir*, in German, by his widow (1868–71); her own *Life and Letters*, ed. by Hare (1879; 6th ed. 1890); Bunsen's *Correspondence with Frederick William IV.*, ed. by Ranke (1873).

Bunsen, Robert Wilhelm (1811–99), German chemist, was born in Göttingen. He held four chairs—at Kassel in 1836; Marburg, 1838; Breslau, 1851; and Heidelberg, 1852–89. He laid the foundations of modern organic chemistry. His examination of the waste gases from blast-furnaces led to great economies in their working, as well as to his development of the methods of gas analysis. In 1852 he investigated the electrolytic preparation of the metals, including magnesium, of which he examined the light-giving capabilities; and with Kirchhoff, in 1859, he developed the methods of spectrum analysis, discovering the elements cæsium and rubidium. In the course of these and other researches he invented the battery, burner, grease-spot photometer, filter-pump, ice and vapor calorimeters that are associated with his name and in use in every laboratory throughout the world. Among other books, he wrote *Chemische Analyse mit Spektralbeobachtungen* (1861), with Kirchhoff; *Gasometrische Methoden* (1857; Eng. trans. by Roscoe, 1857); and *Flammenreaktionen* (1880; 2nd ed. 1886). See *R. W. Bunsen ein Gedächtnissblatt* (1900), Debus's *Erinnerungen an R. W. Bunsen* (1901), and Roscoe's *Memorial Lecture Jour. Chem. Soc.* (1900).

Bunsen Burner. In this appliance a jet of coal gas is directed into a tube which is open at both ends, and usually vertical. As a result air is drawn in by the current of gas, and mixes with it, so that, when ignited at the top of the tube, the mixture burns with a very hot, non-luminous flame. Bunsen burners are used for heating by gas, both for technical and domestic purposes.

Bunsen Cell. See Cell, Voltaic.

Bunt. See Plants, Diseases of.

Bunter, in geology the lowermost subdivision of the Triassic or New Red Sandstone, so called from a German word meaning 'variegated.' It consists of mottled red sandstones and breccias, with interpolated pebble beds. Few fossils are found in these rocks, which seem to have been deposited in old salt lakes, in countries subject to desert conditions. In Britain their principal exposure is in the Midland counties (*e.g.* Cheshire and Staffordshire), where their greatest thickness is about 2,000 feet. The red sandstones have been used for building—*e.g.* Chester Cathedral.

Bunting, a term properly applied to birds belonging to the family Emberizidæ. They are related to finches, and are robust, with thick beaks, and confined to the Old World; but several of the larger American finches, more or less related, are styled 'buntings.'

Bunting, Jabez (1779–1858), 'second founder of Methodism,' was a Manchester tailor's son. In London he filled the highest posts in his denomination, and transformed the Methodist Society into a self-governing church, over which he exercised great authority. His chief interest was in the Wesleyan missions. See *Life* by T. P. Bunting (1859).

Bunyan, John (1628–88) author of the *Pilgrim's Progress*, was born at Elstow, Bedfordshire, England, where people of his surname can be traced back to the 12th century. Nevertheless there is good reason to believe that John Bunyan belonged to a caste of itinerant tinkers or gypsies. For a full discussion of this question, reference may be made to F. H. Groome's *Gypsy Folk-tales*, pp. 293–295 (1899). Bunyan's early youth, according to his own account, was notoriously ungodly; but although he fought for a few months as a soldier in the Parliamentary army, his marriage to a young woman of religious character when he was only nineteen, his subsequent baptism and admission to 'church privileges,' and the fact that his *Sighs from Hell* (a record of spiritual struggle) appeared when he was just two-and-twenty, all point to his having abandoned his evil ways at the very outset of his career. Bunyan soon began (1655) to preach in the villages, and his graphic discourses had a powerful effect upon his hearers. In 1656 he wrote his *Gospel Truths Opened* and *A Vindication* of it (1657), both directed against the Quakers; and at the assizes in the following year an indictment was preferred against him for preaching at Elstow. Although for the time he escaped punishment, soon after the restoration he was convicted (Nov., 1660) as 'a common upholder of several unlawful meetings and conventicles,' and was committed to Bedford jail, where he remained for twelve years, till 1672. During his imprisonment he wrote the first part of his immortal allegory, the *Pilgrim's Progress* (1677); though the Rev. John Brown assigns this to Bunyan's second imprisonment, of six months' duration, in 1675. During the earlier and longer imprisonment he also wrote four other books—*viz.*, *The Holy City, or the New Jerusalem* (1665); *Grace Abounding to the Chief of Sinners*, an autobiographical and devotional narrative (1666); *Justification by Jesus Christ* (1671); and *Defence of the Doctrines of Justification* (1672). In 1671, the year before his release, Bunyan was elected pastor of the Baptist church at Bedford. In 1673 he published his *Differences about Water Baptism no Bar to Communion;* in 1680, *The Life and Death of Mr. Badman;* in 1682, *The Barren Fig-Tree;* in 1684, the second part of the *Pilgrim's Progress* and *The Holy War;* in 1685, *The Pharisee and the Publican;* and in 1688, *The Jerusalem Sinner Saved*, *Solomon's Temple Spiritualized*, and *The Water of Life*. He died on Snow Hill, Holborn, and was buried at Bunhill Fields, London.

A full list of Bunyan's works was given in Charles Doe's *Catalogue Table* (1691). One of the most carefully collected editions is that entitled *The Works of John Bunyan, with an Introduction, Notes, and Sketch of his Life and Contemporaries*, by George Offor (3 vols. 1862).

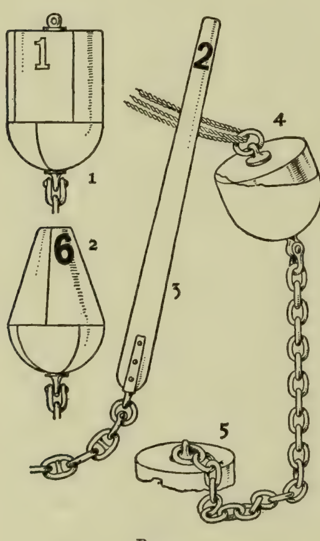
George Whitefield published an edition of the works in 1767, and Mason's edition, with notes, appeared in 1785. Southey's edition (1830) is one of the best, and his *Life* of Bunyan still holds its place. The Hanserd Knollys Society published an exact reprint of the first edition, edited by G. Offor (1847). See also *Lives* of Bunyan by Ivimey (1809), Philip (1839), J. H. Froude, 'English Men of Letters Series' (1880; New York, 1888), J. Brown (1885), and Edmund Venables (1888).

Bunzlau, tn., prov. Silesia, Prussia, 24 m. w. of Liegnitz; famous for its brown pottery ware. Birthplace (1597) of the poet Opitz. Pop. (1900) 14,590.

Buonaparte. See Bonapartes, The, and Napoleon.

Buonarroti. See Michelangelo.

Buoy (Du. *boei*), a floating object designed to mark:—the limit of a channel; the position of a rock, shoal, or other danger to navigation; the position of an anchor, or of a telegraph cable; or the limit of an anchorage, dumping, or quarantine ground. A buoy is also used to support the end of a permanent mooring, the ship making fast to the buoy directly or to the end of the mooring chain beneath the buoy.

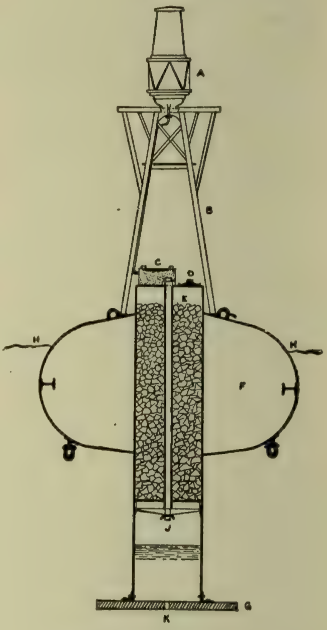


Buoys.

1. Can buoy. 2. Nun buoy. 3. Spar buoy. 4. Mooring buoy. 5. Method of mooring buoy.

In the United States the buoyage of harbors, channels, shoals, etc., is controlled by the Lighthouse Board. In approaching a harbor or an anchorage from seaward, a bell or whistling buoy usually marks the outer end of the channel; black buoys with odd numbers will be found on the port edge of the channel, and red buoys with even numbers will be found on the starboard edge. Buoys with vertical stripes of black and white are placed in mid-channel, and must be passed close to avoid danger. Danger buoys, marking outlying rocks or shoals, have horizontal stripes of black and red. Buoys marking submerged wrecks are green; those marking anchorage grounds are white; and quarantine buoys are yellow. The United States is almost the only country having a uniform system of buoyage. The diversity of the buoyage in different localities is very confusing to navigators. Except in winter, nearly all important buoys are iron tanks with hemispherical bases below water, and have conical (nun buoys) or cylindrical (can buoys) tops. In winter, in the channels where much ice is found, the iron tanks are replaced by long spars (similarly painted), which are less liable to be injured by the ice. In some important channels the buoys showing the channel limits are all lighted, either by electricity brought to them by a cable, or by self-contained gas.

Acetylene Gas Buoy.—A great improvement in gas-lighted buoys became possible with the invention of a commercial process for the production of calcium carbide, from which acetylene gas is made by the simple addition of water. The brilliancy and penetrating power of the acetylene light renders it especially valuable for marine lighting. The Willson buoy, invented by T. L. Willson, inventor of the commercial carbide process, has come widely into use. It generates its own gas at the low pressure of about six pounds to the square inch, and with one full charge of carbide, varying from 1,300 to 3,500 lbs., according to the size of the buoy, gives a continuous light for from six to nine months without attention. These buoys are equipped with lanterns of varying sizes, ranging from 140 to 1,000 candle power, and carried at varying heights above the water level. In operation, the buoy is placed in the water, after filling the generator with large pieces of carbide, the valve at the bottom of the carbide chamber being open. Water flows in upon the carbide and acetylene gas is produced, passing up through the carbide and into the purifier, and thence to the lantern. When the gas is produced faster than it is consumed it accumulates in the generator, and when its pressure is greater than that of the water, it forces the water out of the carbide, and the generation of gas is stopped until the gas pressure becomes less than that of the water. This automatic action continues until all the carbide has given up its gas, when the buoy must be recharged.



Automatic Acetylene Buoy

A, lantern; B, tower; C, purifier; D, recharging door; E, carbide chamber; F, air flotation chamber; G, ballasting counter-weight; H, water line; J, water-inlet valve; K, water port.

Buoyancy. See Shipbuilding, Hydrostatics, Specific Gravity.

Buprestis, a genus of beetles whose members are remarkable for the metallic brilliancy of their coloring, especially in the case of tropical forms. The coloring is chiefly present in the hard wing-covers, which are often used as ornaments.

Burbage, Richard (?1567–1619), English actor. He became joint-proprietor of Blackfriars Theatre, and in 1599 transferred 'the Theatre' from Shoreditch to Southwark, under the name of the Globe. As an actor, chiefly at the Globe, Burbage excelled all rivals in tragedy. He filled the chief parts in Shakespearean plays (*e.g.* Richard III., Hamlet, Lear, Othello), in those of Ben Jonson, and of other writers. See Halliwell-Phillipps's

Outlines of the Life of Shakespeare (1885).

Burbank, Luther (1849), American horticulturist, was born at Lancaster, Mass., the son of a farmer and manufacturer, and after working as a wood turner and pattern maker at Worcester, decided to devote himself to horticulture. He bought a farm at Lunenburg, Mass., and began his experiments with fruits, flowers and vegetables, and while there developed the well-known Burbank potato. In 1875 he removed to Santa Rosa, Cal., believing that climatic and soil conditions in that region offered greater promise for the execution of his purpose. Subsequently he purchased a tract of four acres within the limits of the city for a home and established an experimental farm of fifteen acres at Sebastopol, several miles distant, where he found the lighter soil and warmer exposure needed for his most important work. At these two places, but mainly the latter, he carried on a costly, patient work that was ultimately crowned with marvelous achievements, without any pecuniary assistance till 1904, when the Carnegie Institution unanimously voted him $10,000 per annum for ten years, to enable him to prosecute his experiments without concern for his financial necessities.

When he went to Santa Rosa his principal capital was ten Burbank potatoes, which he had reserved from the stock raised and sold to a seedsman in Massachusetts. His offer to supply the growers of California with quantities of the new potato for planting met with a liberal response, as the large growers were eager to obtain improved seedlings because of the deterioration of existing varieties. While raising the potato for seed he applied himself closely to the nursery business and also gave much attention to plant breeding. Unlike the general practice of investigators, he took the world, especially the horticultural part of it, into his confidence. In 1893 he issued a modestly worded publication, *New Creations in Fruit and Flowers*, and supplemented it with others in 1894, 1898, 1899, and 1901, in which he described and pictured many of his achievements. These publications elicited widespread and very diverse comment. In the horticultural world amazement followed surprise as one after another new variety of unfamiliar growths was made known. He had already given the world visible, tangible entities, not promises nor prophecies.

In an appreciative review of his work, Dr. Edward J. Wickson, professor of agricultural practice at the University of California, thus summarized Mr. Burbank's accomplishments: (1) Varieties have been secured which are prolific where the older sorts have proved unsatisfactory; (2) varieties have been produced which, by early and late ripening, prolong the fruit season three or four months; (3) varieties have been produced which show almost incredible precocity in bearing fruit; (4) surprising changes in the natural structure of fruits have been secured, the most notable of which perhaps is the elimination of the shell inclosing the kernel in what is called stone fruits; (5) the ranges of flavor and aroma in several fruits have been enriched and extended; (6) radical changes in form or color have also wrought havoc with old forms of speech, as 'plum-colored' and 'plum-shaped,' that fruit in form having entered the domain of the apple and tomato, and the conventional form of the pear has been inverted; (7) the foregoing results have been obtained by selection and by crossing within the limits of species and variety. Professor Wickson also stated that still more surprising achievements had been reached by crossing fruits which belonged to genera heretofore supposed to be hedged about by impassable barriers. Another noteworthy appreciation was by Prof. David C. Fairchild, eminent as a botanist in the service of the U. S. Department of Agriculture, who, after visiting Mr. Burbank, said: 'It must not be left out of account that this New Englander, transplanted to the Pacific coast, has probably in the last twenty-five years combined more different varieties, species, and genera of plants by cross fertilization than any other living man.' According to Professor Fairchild, Mr. Burbank's methods found their keynote in the principle of immense numbers. Instead of planting, as an ordinary gardener would, a dozen seeds or a few hundred from which to select his new forms, he put out in his seed beds or seed boxes millions of them. Long practice with millions of seedlings enabled him to distinguish at a glance a slight peculiarity in a seedling which indicated that as this plant developed it would show other characteristics widely different from the familiar form.

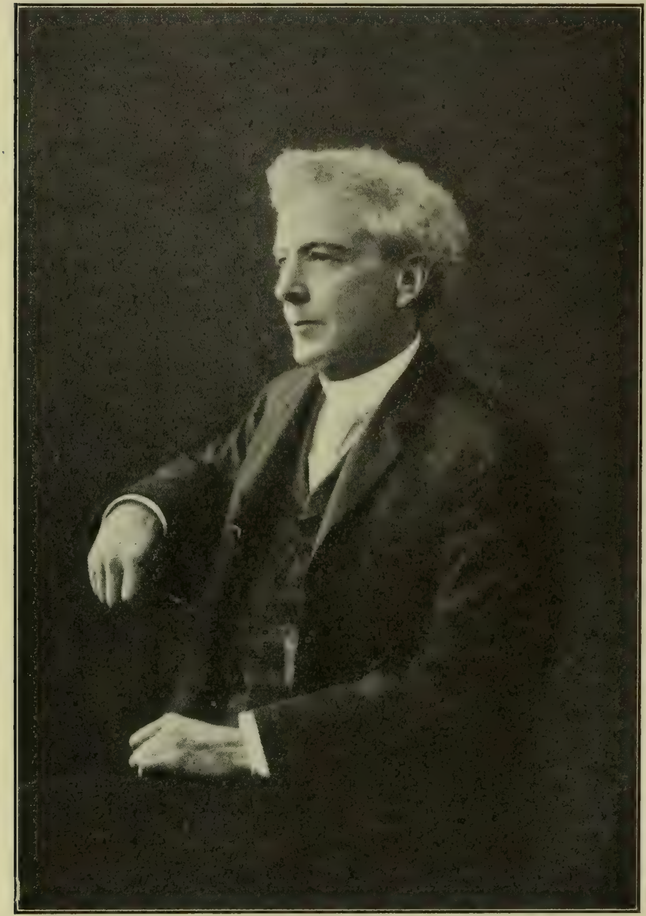
At the beginning of his experiments in horticulture, Mr. Burbank was obliged to procure his collections from the ordinary stock of the seedsmen, but after removing to California he began collecting seeds from the native plants, and in studying their peculiarities he realized a marvelous tendency toward variation in that state. In his later work, and to secure results which he believed were possible, he drew upon the entire world for needed specimens. Touching the relation of plant nature to human insight and effort, Mr. Burbank, in an essay presented at the Floral Congress in San Francisco in 1901, wrote: 'The chief work of the botanist of yesterday was the study and classification of dried, shriveled plant mummies, whose souls had fled, rather than the living plastic forms. We have learned that they are as plastic in our hands as clay in the hands of the potter or color on the artist's canvas, and can readily be molded into more beautiful forms and colors than any painter or sculptor can ever hope to bring forth. The changes which can be wrought with the most plastic forms are simply marvelous, and only those who have seen this regeneration transpiring before their very eyes can ever be fully convinced.'

The space allotted for this article will permit only a brief reference to his most important achievements. From a half hardy plant found in west central Australia he developed the 'Australian star flower,' a magnificent growth, which possesses the remarkable peculiarity of retaining permanently both its color and perfume. From the familiar common yellow 'California poppy' he created a flower of beautiful crimson, and from two white varieties, the common white opium poppy and another, he obtained a new red garden poppy. His popular 'Shasta daisy,' which he bred on a colossal scale, was developed by crossing the common field daisy of the East with a daisy from Europe and another from Japan, and is now cultivated in two forms, a single and a double flower. Other new floral creations include a hybrid yellow calla; a most prolific blooming hybrid lily; many hybrid amaryllis; the Snowdrift; a new race of bell-shaped clematis, with broad flowers exquisitely frosted and blending of colors and shadings not found elsewhere in the clematis family; new crinums; the California gladiolus; a new double gladiolus; a new species of columbines; several varieties of the lily, remarkable for enhanced beauty and perfume; new and hardy varieties of the tea rose, secured by using the hardy Hermosa as a joint parent with the best existing tea roses of the florists.

Mr. Burbank gave an insight into his method of cultivation and domestication in a public address in San Francisco, in the following words: 'There is not one weed or flower, wild or domesticated, which will not sooner or later respond liberally to good cultivation

Died
Apr. 11, 1926.

and persistent selection. Any variation should be at once seized upon and numerous seedlings raised from this individual. In the next generation, one or several even more marked variations will be almost certain to appear, for when a plant once wakes up to the new influences brought to bear upon it, the road is opened for endless improvement in all directions, and the operator finds himself with a wealth of new forms which is almost as discouraging to select from as, in the first place, it was to induce the plant to vary in the least.' At another time, in speaking of his efforts to secure new varieties that would mature more quickly than the original ones, he said: 'I have been working for a good while to produce a quick-bearing chestnut. The ordinary chestnut of the woods may take from ten to fifteen years from the seedling stage to the nut-bearing stage, but as a result of experimenting I have a specimen tree on my grounds this year (1908) six months old, that has borne two perfect burrs, and each has its regulation number of nuts.'



Luther Burbank

Mr. Burbank cited as an interesting feature in plant experimentation the occasional cropping out of reversions to primitive forms now lost through long cultivation, and said that he was running Indian corn back to where it was, maybe two or three thousand years ago. 'Corn, as we know it to-day, is an artificial product, the result of generations or centuries of selection before the white man ever saw it. I have already secured permanent forms with the grains borne in the tassel, like other grasses, for corn is only a giant grass.'

In the line of fruits Mr. Burbank achieved as distinct triumphs as in that of flowers. Foremost among his creations were the stoneless plum, produced by crossing the *prunier sans noyeau*, a fruit that had been known for a hundred years as a curiosity, with the French prunes and other prunes, and the plum-cot, an entirely new fruit, obtained by the crossing of plums and apricots. He spent ten years in developing the former, the most tedious part being the breeding out of the stone, and the increasing of the size, quality, and productiveness of the fruit. Then there are the improved beach plums, Bartlett plum, Climax plum, and improved varieties of the California wild plum. The peach almond is a hybrid of the Wager peach and the Languedoc almond; the Pineapple quince is a luscious fruit combining the qualities of each of its parents; the blueberry is the eastern variety improved in California soil; and the white blackberry is what Wickson called 'one of Mr. Burbank's most startling achievements.' To these should be added some new varieties of grapes, originating from the Isabella Regia of California growth, a large black grape. Two developments from this are a white, seedless fruit, ripening early in the season, and another which ripens about the holidays.

Mention of Mr. Burbank's thornless cactus has been purposely left to the last, because, in view of its enormous economic value, the writer considers it his most important achievement. The narrative of its evolution is thus told by its creator (1908): 'Twelve years ago I became impressed with the possibilities of the *opuntia cactus*, or prickly pear, as a forage plant. If only the spines and bristles could be done away with. I had specimens sent to me from all over the world, and by selecting and crossing, raising year after year thousands of new seedlings only to be destroyed as unavailing, I at last was rewarded in creating a variety absolutely without spines or bristles. I have half a dozen other spineless varieties, and they were all put on the market for the first time last summer.' No absolutely spineless cactus of great agricultural or horticultural value has ever before been cultivated or known, though so-called spineless ones are now being diligently hunted for in every country where the cactus is known to grow. Some of these partially thornless ones are now being exploited as the 'true Burbank Spineless Cactus.'

Burbot. The only species of fresh-water cod (*Lota lota*), which inhabits some of the rivers of North Europe, and sometimes has a weight of 12 pounds. An American representative (*L. maculosa*) is numerous in the Great Lakes and in the N.E. United States. The flesh of neither kind is very good. The American variety is sometimes known as ling, loche, or cusk, burbot being the English name for this fish. In shape it is long, with broad head and tapering, compressed posterior, and is covered with small, deep-rooted scales.

Burchard, SAMUEL DICKINSON (1812–91), American clergyman, was born at Steuben, N. Y., and graduated (1836) at Centre College, Ky. He became pastor of a Presbyterian Church in New York city (1839), with which he was associated for forty years. From 1879 to 1885 he was pastor of the Murray Hill Church in New York. In the Presidential campaign of 1884 he addressed James G. Blaine on behalf of a gathering of ministers, ending his speech with the words: 'We are Republicans, and do not propose to leave our party and identify ourselves with those whose antecedents have been rum, Romanism, and rebellion.' Mr. Blaine appears to have missed the point. At any rate, he did not protest, and the expression, being widely circulated, gave offence to Roman Catholics, and Blaine lost New York State and the Presidency.

Burchiello (1404–48), Italian poet, whose real name was DOMENICO DI GIOVANNI, and who received his nickname from a certain portion of his poems, which deals with the most inconsistent themes, and are put together 'any how' (*alla burchia*). Born at Florence, he wrote some sonnets against Cosimo de' Medici which compelled him to leave his native city (1434). In Siena, where he led a vagrant life, his satirical writings eventually caused him to be imprisoned. He died at Rome in great poverty. Many of his sonnets deal in a burlesque vein with his personal affairs; others are directed in a satirical spirit against the Sienese and against individuals in high places. The comic genre of this poet led to many imitations, called *burchiellesco*. See Mazzi's *Burchiello*.

Burckhardt, JAKOB (1818–97), Swiss historian of art, born at Basel; in 1850 he became professor of art history at the University of Basel. His principal work is *The Cicerone or Art Guide to Painting in Italy* (1855, Eng. trans.), which became a classic because of its clear and useful descriptions, dealing with sculpture and architecture as well as painting. In *The Civilization of the Renaissance in Italy* (1860, Eng. trans.), he analyzes with force and skill the characteristics of the Renaissance. Other noteworthy books, include *Geschichte der Renaissance in Italien* (1867); *Die Kunstwerke der Belgischen Städte* (1842); *Die Zeit Konstantins des Grossen* (1853); *Griechische Kulturgeschichte.* See Trog's *Jakob Burckhardt* (1898).

Burckhardt, JOHN LEWIS (1784–1817), Eastern traveller, was born at Lausanne, Switzerland. He went to England in 1806, and was engaged by the African Association to explore N. Africa. In Oriental attire, and under the name of Sheik Ibrahim, Burckhardt visited Palmyra, Damascus, and Lebanon; proceeded to Cairo; made two journeys to Nubia (1814), and thence went to Mecca and Medina, returning to Cairo in 1816. Driven out by the plague, he visited Mt. Sinai, but returned in 1817 to Cairo, to join the Fezzan caravan to the interior of Africa. Attacked by dysentery, he died at Cairo before it started. He wrote *Travels in Nubia* (1819); *Travels in Arabia* (1829); *Notes on the Bedouins and Wahabys* (1830); *Arabic Proverbs* (1830).

Burdekin River, Queensland, Australia, rises in Sea View range, flows by Charters Towers and Ravenswood gold fields, and falls into the Pacific Ocean at Upstart Bay.

Burden, the term formerly applied to the tonnage measurement of a ship. See TONNAGE.

Burden of Proof. See PROOF.

Burdett, SIR FRANCIS (1770–1844), British politician, entered Parliament for Boroughbridge in 1796; and in 1807, by his return for Westminster, which he represented for thirty years, won the first triumph for parliamentary reform. Burdett made himself unpopular with the government by vigorously supporting freedom of speech and Catholic emancipation, as well as by protesting against the suspension of the Habeas Corpus Act, the existing prison discipline, and the enormous taxation. He was sent to the Tower for a breach of privilege, but soon regained his liberty. Again, in 1819, he attacked the authorities in a letter on the 'Peterloo massacre,' and was imprisoned for three months. After the Reform Act of 1832 Burdett took no prominent part in public affairs.

Burdett-Coutts, ANGELA GEORGINA, BARONESS (1814–1906), daughter of Sir Francis Burdett. She inherited in 1837, the great wealth of her grandfather, Thomas Coutts, a London banker, and was asked in marriage, among others, by Prince Louis Bonaparte. She greatly distinguished herself by the financial aid she gave to benevolent and philanthropic schemes. The weavers of London, the Irish fishermen of Cape Clear, the Turkish peasantry after the Russo-Turkish War of 1877, the aborigines of S. Australia all received assistance from her. She liberally endowed the colonial bishoprics of Cape Town, Adelaide, and British Columbia, subsidized Sir Henry James's topographical survey of Jerusalem, and gave pecuniary assistance to Rajah Brooke in Sarawak. In 1871 Queen Victoria, in recognition of her philanthropic work, conferred upon her a peerage, and in 1881 she married Mr. W. L. Ashmead-Bartlett. The Baroness edited, in 1893, *Woman's Mission,* a 'Series of Congress Papers on the Philanthropic Work of Women, by Eminent Writers' (8 vols.).

Burdette, ROBERT JONES (1844), American humorist, was born at Greensborough, Pa., and removed to Peoria, Ill., as a boy, where he received a common-school education. He served as a private in the Illinois volunteers during the Civil War, and subsequently worked on Peoria newspapers for some years, joining the Burlington *Hawkeye* in 1872, in whose columns many of his humorous writings appeared. He also gave humorous lectures, and in later years was a member of the staff of the Brooklyn *Eagle.* Mr. Burdette was licensed to preach by the Baptist Church in 1887, and in 1903 was ordained and made pastor of the Temple Baptist Church at Los Angeles, Cal. He became pastor emeritus in 1909. His books include *Hawkeye* (1880); *Innach Garden, and Other Comic Sketches* (1886); *Chimes from a Jester's Bells* (1897); *Smiles Yoked with Sighs* (1900).

Burdick, FRANCIS MARION (1845), American lawyer, educator, and editor, was born in De Ruyter, N. Y. He was graduated from Hamilton College in 1869, and from the Law School in 1872. In 1872 to 1883 he practised law in Utica, serving one term as mayor of that city. Since 1882 he has served as professor of law at Hamilton College (1882–1887), Cornell University (1887–1891), and Columbia University (1891). Since 1907 he has been New York commissioner on uniform State laws; and is now an editor of the *American Year Book,* in charge of the Department of Law and Jurisprudence as the appointed representative of the American Bar Association. Among his books are: *Law of Sales* (1901); *Essentials of Business Law* (1902); *Cases on Torts* (3d edition, 1905); *Law of Partnership* (2d edition, 1906); *Law of Torts* (2d edition, 1908).

Burdock (*Arctium Lappa*), a coarse plant of the Compositæ, common in temperate regions of the Old World, and naturalized in America. The flower head, a 'bur,' is covered with small hooks, and readily attaches itself to any passing body, thus securing wide distribution of the seeds. It is used medicinally as a diaphoretic and diuretic, and in Japan is eaten as a vegetable.

Burdwan. See BARDWAN.

Bureaucracy is a term applied to the highly centralized forms of administration in which the officials of a department or bureau are responsible to their administrative superiors only, and are not amenable, in their official capacity, to the common law of the land. Prussia is the typical bureaucratic country, but most of the Continental nations have a similar form of highly centralized administration, with extensive powers of regulation, superintendence, and inspection over the lives and actions of the subject by officials who are responsible only to the head of their own department.

Bureau of American Ethnology. See SMITHSONIAN INSTITUTION.

Bureau of American Republics. See PAN AMERICAN UNION.

Bureau of Corporations. The act of Congress of 1903, creating the Department of Commerce and Labor, established under that department a Bureau of Corporations, to be presided over by a Commissioner of Corporations, charged with the duty of making inquiries into the business of corporations engaged in inter-State and foreign trade, with a view to securing information upon which the President may base recommendations for legislation regulating such corporations. The Bureau of Corporations is given the power to subpœna and compel the attendance of witnesses, to examine the books of a corporation, and otherwise to secure the information sought.

As a consequence of experience in one of the early investigations conducted by the Bureau, in which testimony given by persons under indictment for violation of the Anti-Trust law served as a basis for a plea for immunity, the Bureau investigators have found it expedient to limit their inquiries to such facts as may be discovered, without accepting testimony of those whose acts may be subject to investigation by the Department of Justice. The most important investigations of the Bureau of Corporations have been those relating to the beef industry (1904–05); the sugar and the coal industries (1906); the transportation of petroleum (1907); the prices of petroleum and the profits from the industry (1907); the tobacco industry (1909); taxation of corporations in New England (1909); in the Middle States (1910). Special reports are submitted to the President upon the conclusion of each investigation, and an annual report from the Bureau is submitted with the annual report of the Department of Commerce and Labor (q.v.).

Bureau of Lighthouses, created in 1910 to take the place of the Lighthouse Board, is a bureau of the Department of Commerce and Labor. It has charge of the construction and maintenance of lighthouses and lighthouse vessels, signals and buoys, and generally of the lighthouse service; also custody of the archives, apparatus, etc., appertaining to that service. The Bureau consists of a commissioner and deputy commissioner of lighthouses, a chief engineer, a superintendent of naval construction, and 19 inspectors for as many lighthouse districts, who are naval officers or army engineers.

Bureau of Mines. The National Bureau of Mines for the United States was established by act of Congress approved May 16, and effective July 1, 1910. The chief purpose of the Bureau is to carry on inquiries and investigations with the view of lessening loss of life and waste of resources in mining and metallurgical operations. The Bureau is to make investigations of the methods of mining, especially in relation to the safety of miners; the appliances best adapted to prevent mine accidents; the improvement of mining conditions; the treatment of ores and other mineral substances; as to the use of explosives and electricity in mining; and other inquiries and technologic investigations pertaining to mining, metallurgical, and quarry industries.

The act establishing the Bureau provides that no officer or employee of the Bureau of Mines shall exercise any right or authority in connection with the inspection or supervision of mines and metallurgical plants in any State. Under the Constitution, such inspection and supervision is within the province of the State.

The act also transferred to the Bureau of Mines the personnel and equipment of the technologic branch of the U. S. Geological Survey. This personnel and equipment were developed during the preceding five years in connection with the investigation of fuels and mine accidents, and the new Bureau is to continue similar investigations.

The chief experiment station is located at Pittsburg, Pa. At this station the Bureau is conducting a number of investigations in connection with the use of explosives and electricity, and other mining problems. The work in the laboratories is supplemented by experiments conducted in a small coal mine under the conditions of actual mining.

As a means of facilitating its investigations of mine accidents, which include mine rescue, and first aid to the injured work, the Bureau of Mines has purchased and equipped with rescue apparatus, first aid and fire fighting devices, six cars of standard Pullman size, each completely fitted with modern appliances. These cars, one stationed in each of the important coal fields or coal-mining regions of the country, will visit all the important groups of coal mines, where demonstrations and illustrations of this work will be given. This will enable the Bureau to render aid after mine disasters and to promote mine rescue work.

The law establishing the Bureau of Mines became effective on July 1, 1910, and a few days later Mr. George Otis Smith, Director of the United States Geological Survey, was temporarily appointed Acting Director. On September 1, Dr. J. A. Holmes, formerly chief of the technologic branch of the Geological Survey, was appointed Director of the new Bureau.

Buren. See VAN BUREN.

Burette, in chemistry, is an apparatus used in volumetric analysis to deliver accurately measured quantities of liquids. It consists of a vertical glass cylinder of uniform bore, usually graduated in cubic centimetres, and fitted with a stopcock from which any desired quantity of a solution may be allowed to flow.

Burg, town, province Saxony, Prussia, 15 m. by rail N.E. of Magdeburg; the seat of important cloth manufactures, dating from the 12th century, but in part founded by French and Walloon immigrants after the Edict of Nantes. Pop. (1905) 23,500.

Burgage Tenure, an ancient form of tenure in certain English boroughs, whereby the tenant holds of the lord of the borough in fee by a fixed rent. In Scotland, the tenure of property in royal burghs. See TENURE.

Burgas, town, Bulgaria, on the Black Sea, connected by rail with Sofia, and in steamboat communication with Odessa and Constantinople. Exports grain, wool, tallow, butter, and rose water. Pop. 15,000.

Burgdorf (Fr. *Berthoud*), a picturesque and ancient industrial town on the Emme, in the Swiss canton of Berne. It is 14½ m. by rail N.E. of Berne. It manufactures ribbons and silk. Pop. (1908) 9,000.

Burgee, the distinguishing pennant of a yacht club, is a V-shaped pennant, with the point away from the staff.

Bürger, GOTTFRIED AUGUST (1747–94), German poet. In 1772 he received an official appointment at Altengleichen, near Göttingen; this post he resigned in 1784, and became private lecturer at Göttingen. Bürger admired Shakespeare, and learned much from Herder's literary criticism, while he found models of popular ballads in Percy's *Reliques* (1765).

He is often regarded as before all a writer of ballads. Of these, *Lenore* (1774) is the most famous; William Taylor's rendering of it had a marked influence on Sir Walter Scott. Other well-known ballads are *Das Lied vom braven Mann* (1776); *Der wilde Jäger* (1778); *Der Kaiser und der Abt* (1784). Bürger was one of the first to restore the sonnet to honor. There are good editions of his poems by A. E. Berger (1891), and by Grisebach (1894), who also issued his *Abenteuer des Freyherrn von Münchhausen* (1890), retold and amplified. See *Life*, in German, by Döring (1827; new ed. 1848) and W. von Wurzbach (1900).

Burger, SCHALK WILLEM (1852), late president of the Transvaal, succeeded to that position on the flight of President Krüger from Lorenzo Marques for Europe on October 19, 1900. Mr. Schalk Burger was, up to the period of the Jameson Raid (1895–6) at all events, one of the few progressive members of the First Raad, in which he represented (1887 onwards) the Lydenburg district, and ranged himself on the side of General Joubert. He was (1895) chairman of the Assembly, and in 1896 was chosen a member of the executive council. In 1897 he was chairman of the Industrial Commission, which went a long way in admitting the grievances of the Uitlanders. In 1898 Schalk Burger and Joubert stood as candidates for the presidency, in opposition to Krüger, but unsuccessfully. At the outbreak of hostilities Schalk Burger proceeded with Joubert to Natal. He was at the time commandant of the Lydenburg district, but during the course of the war was promoted to the rank of general. He was with Louis Botha during at least a portion of the Tugela operations, and was present at the battle of Spion Kop. On the death of General Joubert (March 27, 1900) he was appointed vice-president of the Transvaal. He remained in the field with Louis Botha till the end of the campaign, and was one of those who signed the terms of surrender at Vereeniging. In the war of 1880 he invested the English garrison at Lydenburg, but, in spite of his superior force, failed to compel their surrender.

Burgers, THOMAS FRANÇOIS (1834–81), president of the Transvaal republic, was a minister of the Dutch Reformed Church for eight years. He succeeded Pretorius as president of the Transvaal in 1872, and in 1875 unsuccessfully attempted to negotiate the Delagoa Bay railway scheme in England and in Europe. He conducted an unsuccessful war with Secocœni in 1876, one result of which was the British annexation of the Transvaal on April 12, 1877.

Burgess. In mediæval England the term burgess signified a freeholder in a chartered town. Only burgesses could participate in the municipal government. With the increase in number of landless inhabitants of the towns, and the surrender of privileges by the smaller landholders, the burgesses came to be practically an oligarchic governing body, perpetuating itself by hereditary succession, or by co-optation. In American colonial history the term was used usually in its original sense as citizen of a town, and is still thus used in parts of New England. In colonial Virginia, however, the term is found in the sense of a member of a legislative body, in the 'House of Burgesses,' the colonial legislature. In England, since 1835, the municipal electors of a borough are the burgesses. In general, they are the occupiers of houses or other buildings of any value, or of land of the annual value of £10, in the borough, who have paid rates and resided in, or within seven miles of, the borough for a year, and they include unmarried women otherwise qualified. They are entitled to, and must be, enrolled; and the burgess roll is the register of municipal electors.

Burgess, ALEXANDER (1819–1901), American P. E. prelate, was born in Providence, R. I., and graduated (1838) at Brown, and at the N. Y. General Theological Seminary (1841). He was ordained a priest (1843), and was rector of a church at Augusta, Me., in 1843–54. From the latter year to 1867, he was rector of St. Luke's, Portland, from there going to Brooklyn, N. Y., and then to Christ Church, Springfield, Mass., where he remained until his consecration as bishop of the newly formed diocese of Quincy, Ill., in 1878. He published various addresses and sermons.

Burgess, EDWARD (1848–1901), American yacht designer, was born at West Sandwich, Mass.; he was the son of a wealthy trader with the West Indies, and graduated (1871) at Harvard. His father experiencing financial reverses, Burgess served as instructor in entomology at Harvard in 1879–83. He had previously studied naval designing while on a trip to Europe, and had planned several successful cutters before he took up teaching. He began, with his brother, Sidney Burgess, the business of yacht designing at Boston in 1883, and received his first order for a yacht to defend the *America's* cup in the spring of 1885. He designed the *Puritan*, a centreboard yacht, which beat the English *Genesta* handily in the September races of the same year. He repeated the experience in 1886 with the *Mayflower*, which won a victory over the *Galatea*, and again in 1887 with the *Volunteer*, which defeated the *Thistle*, designed by George W. Watson. This was an unprecedented record, and brought Mr. Burgess honors and a great number of orders for yachts and fishing craft of every description. He was carried off in the middle of his career by an attack of typhoid fever.

Burgess, FRANK GELETT (1866), American humorist and illustrator, was born in Boston, Mass., and graduated (1887) as a civil engineer at the Mass. Institute of Technology. Some of his publications are *The Purple Cow* (1897), *The Nonsense Almanack* (1898), *Goops and how to be Them* (1900), *Romance of the Commonplace* (1902), and *The Picaroons*, with Will Irwin (1903).

Burgess, FREDERICK (1853), American P. E. prelate, was born in Providence, R. I., and graduated (1873) at Brown, taking his course in divinity at the N. Y. General Theological Seminary, and studying for a year at Oxford. He was ordained priest in 1877, and was rector of several churches, Eastern and Western, until 1898, when he assumed charge of Grace Church, Brooklyn Heights, N. Y. Four years later, on the death of Bishop Littlejohn, he was consecrated bishop of Long Island.

Died Oct. 15, 1925.

Burgess, GEORGE (1809–66), American P. E. prelate, elder brother of Alexander (q.v.), was born in Providence, R. I., and graduated (1826) at Brown. He passed some years abroad, was ordained priest in 1834, and was rector of Christ Church, Hartford, until 1847, when he was consecrated first bishop of the diocese of Maine, making his residence at Gardiner in that state. He published several theological volumes, and his *Poems* were collected and published with an introduction by Arthur Cleveland Coxe in 1868. See *Memoir*, by his brother (1869).

Burgess, JOHN WILLIAM (1844), American educator, was born at Cornersville, Tenn., and graduated (1867) at Amherst. After studying in Germany, he was professor of history and political science at Amherst from 1873 to 1876, when he was called to Columbia to fill a similar position, his title being later changed to that of professor of political science and constitutional law. He was appointed first lecturer on the Theodore Roosevelt foundation of American history and institutions at the University of Berlin, for the years 1906–7, on the recommendation of the trustees of Columbia, in accordance with the agreement entered into by Emperor William II. and Pres. Butler for an exchange of professorships between Columbia and the University of Berlin. Prof. Burgess published important treatises on political science and constitutional law, and writings on American history.

Burgess, NEIL (1846), American actor, was born in Boston, Mass., and was employed for several years in an art store in that city. Becoming dissatisfied, he adopted the stage as a profession, and, making a chance success in the impersonation of a female character, decided to devote himself to this class of work. His presentation of a play written for him—*My Mother-in-Law*—attracted the attention of David Ross Locke, author of the *Widow Bedott Papers*, who arranged with Mr. Burgess for the latter to appear as the Widow Bedott in a dramatization of the work. It was first presented at Providence (1879), and was a success for many years. In 1889 Mr. Burgess produced Charles Barnard's comedy, *The County Fair*, at Philadelphia, which afterward ran for more than two years at the New York theatres. See Clapp and Edgett's *Players of the Present* (1899).

Died 1910

Burghers. See SECESSION CHURCH.

Burghley, WILLIAM CECIL. See BURLEIGH.

Burgkmair, or BURCKMAIR, HANS (1473–1531), German painter and engraver, born at Augsburg. His early German style is well represented by the portrait of himself and wife in Vienna; his later more Italian style by the *Adoration of the Kings* in Augsburg. His great repute rests on his woodcuts, which rank high for their dramatic force and ingenuity, and for their truth to the life of his time. Among the most important of his engravings are *The Triumph of Maximilian* (135 prints) and the *Genealogy of the Emperor* (237 prints); also 52 plates for the *Book of the Tourney*, and 104 designs for a German translation of the *Offices* of Cicero, and 200 for the German translation of Petrarch's *Fortune*. See Wilmot Buxton's *German, Flemish, and Dutch Painting* (1881).

Burglary. The breaking and entering a dwelling-house in the night-time with intent to commit larceny or any other felony. The breaking may be either actual (*e.g.* forcing open a closed window or door) or constructive (*e.g.* gaining admission by conspiracy with a servant). The entering must be actual, but it need not be an entry of the whole person. It is enough if a hand be thrust into a broken window with intent to commit larceny or a crime of violence. If the felonious intent is lacking the act of breaking and entering is only a trespass, and if the act is committed by daylight it is, notwithstanding the felonious intent, only house-breaking. So also if the house is uninhabited at the time the offence is committed or if the building entered is not a dwelling-house, the crime is not burglary. The breaking and entering may be by different persons acting together, and may be on different nights. The heinous character of the offence has rendered burglary severely punishable by the law of all civilized states. In England the penalty is penal servitude for life or for a long period of years, and in this country for varying terms of imprisonment, extending to twenty years. In Scots law, the offence is house-breaking with intent to steal, and it is the worst aggravation of theft. There is no distinction between day and night, or between a dwelling-house and other closed buildings. The same result has been reached by statute in some of the United States, the term burglary being used as coextensive in meaning with housebreaking.

Burglary Insurance. See INSURANCE.

Burgomaster, the chief magistrate in Belgian, Dutch, German, and Austro-Hungarian towns. His duties are similar to those of mayors and provosts in Great Britain, and of *maires* in France.

Burgos. (**1.**) Province, N. Spain, lying between Alava and Navarre. On the whole the province is mountainous, but especially in the N. and N.E. To the S. lies the table-land of Old Castile. In the E. rises the lofty peak of Cerro de San Millan (6,995 ft.), while in the extreme S. is the pass of Pancorbo. The soil is generally poor, and is only adapted for pasturage; gold, copper, silver, and lead are found. The chief rivers flowing through the province are the Ebro, for 62 m.; the Douro, for 37 m.; the Pisuerga; and the Arlanzon. There are potteries, stone quarries, and factories for linen and cotton. Want of railways and of good roads has militated very much against development. Area, 5,650 sq. m. Pop. (1900) 338,828. (**2.**) City, cap. of above prov., on riv. Arlanzon. It stands on the Northern Ry., 142 m. from Madrid, and is a very ancient city, whose principal glory now is its superb Gothic cathedral (1221), which is one of the noblest in the world. The Cid Campeador, the local hero, is buried here. The monastery of the Cartuja and the historical nunnery of Las Huelgas, in the neighborhood, are of the highest interest. The city is the centre of a wheat-growing district and there is some industry in leather, cloth, and hosiery. Pop. (1900) 30,167.

Burgoyne, JOHN (1722–92), English soldier and dramatist. Early entering the military service, he commanded the English force which coöperated with the Portuguese in repelling an invasion of Portugal by the Spanish in 1762, and entering Parliament in 1768 he won favor at court by his political course. He is best remembered, however, for his service in the American Revolution. With Generals Howe and Clinton he joined Gen. Gage in Boston early in 1775, and in 1777, with the rank of lieutenant-general, he commanded the famous expedition sent from Canada to form a junction at Albany with Sir William Howe (then at New York), and to capture as he went the 'American posts which lay upon Lake Champlain.' At the head of an army of about 7,500 (including about 250 Canadians and Loyalists), he reached Crown Point (June 27) and forced the evacuation of Ticonderoga (July 6). At first he was assisted by Indian auxiliaries, whose number at one time probably reached or exceeded 1,000, but, disapproving of their methods of warfare—'I would rather lose every Indian,' he said, 'than connive at their enormities'—he gradually alienated them. Unable to secure provisions in sufficient quantities, unsupported by expected reënforcements from New York, hemmed in on all sides by superior numbers of American militiamen, who flocked in from every quarter to repel his invasion, and confronted by a strong American army first under Gen. Schuyler and then under Gen. Gates, he was forced to surrender to Gen. Gates at Saratoga (Oct. 17) after fighting two stubborn battles (Sept. 19 and Oct. 7). (See SARATOGA, BATTLES OF.) He was bitterly criticised at home, and though he thoroughly vindicated his conduct of the campaign, he failed to obtain a military trial, and resigned his commission. Again entering Parliament, he joined the opposition and advocated a cessation of hostilities in America. He was commander-in-chief in Ireland (1782–4), and in 1787 was one of the managers of the impeachment of Warren Hastings. He wrote several dramas, including *The Maid of the Oaks* (1780); *The Lord of the Manor* (1780), a comic-opera libretto; and *The Heiress* (1786), described by Horace Walpole as one of the most pleasing English compositions and long popular. See his *Works* (2 vols. 1808); De Fonblanque's *Political and Military Episodes of John Burgoyne* (1875); Wrottesley, *Life and Correspondence of Sir John Burgoyne* (2 vols. 1872); and Stone, *Campaign of Lieutenant - General Burgoyne* (1877).

Burgoyne, SIR JOHN FOX (1782–1871), English military engineer, natural son of the above, rendered important services while commanding the engineers in Portugal (1809–13), and as virtual second in command in the Crimean War. He was commanding engineer of the expedition to New Orleans in 1814, and took part in the assault and capture of Fort Bowyer (Mobile Point), in February, 1815. For his Crimean work Burgoyne was assailed by the press, but later became a popular hero, and was made baronet and field-marshal. See his *Life and Correspondence*, by the Hon. G. Wrottesley (2 vols. 1873); Sir J. T. Jones's *Journal of the Sieges . . . in Spain* (1814); A. H. Kinglake's *Invasion of the Crimea* (1899).

Burgrave, or BURGGRAVE, a title frequently borne in the middle ages by the military commandant of a German town. He was appointed by the emperor or by a bishop of the empire. There were burgraves of Nuremberg, Augsburg, Meissen, Regensburg, Magdeburg, and other towns. The title subsequently became hereditary in certain noble families—*e.g.* that of Brandenburg.

Burgundii, a powerful German tribe whose original home was between the Oder and the Vistula; they were of the same race as the Vandals. The Gepidæ drove them from their first habitations into the country about the Main. Early in the 5th century A.D. the usurper Jovinus invited them to settle on the left bank of the Rhine; hence arose the duchy and county of Burgundy.

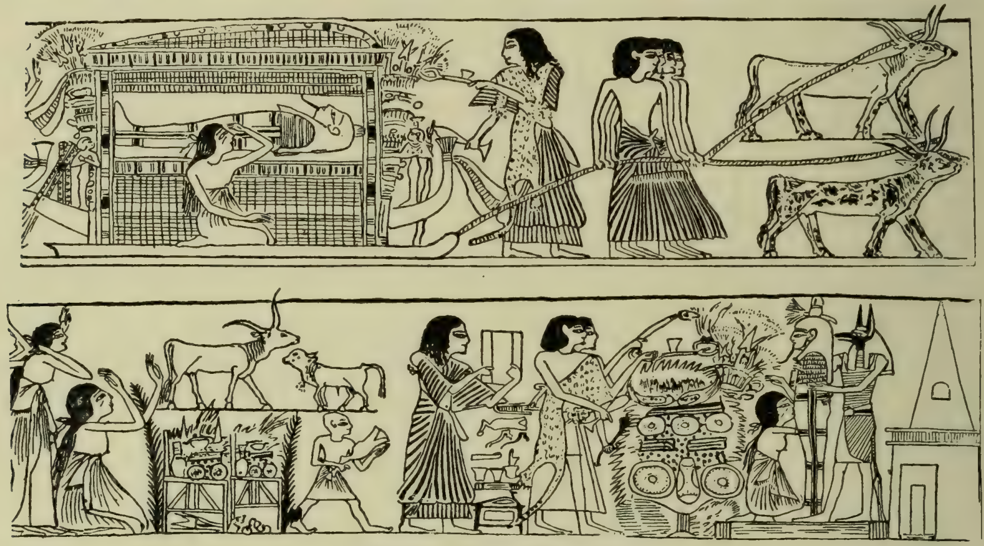
Burgundy (Fr. *Bourgogne*), former province of France, now forming all or part of the departments Ain, Aube, Côte-d'Or, Haute Marne, Nièvre, Saône-et-Loire, and Yonne. The Burgundians invaded the country with the Vandals, 410 A.D., but were vanquished by the Franks in 523, and again became independent in the 9th century. The struggle for supremacy in France between the Burgundians, the French, and the English fills an important chapter of mediæval history. In 1477, on the death of its last duke, Charles the Bold, Burgundy was attached to the crown of France. The name is now mainly associated with the wine of the province. The finest wine is grown on the slopes of hills in Côte-d'Or, and is celebrated for ts rich flavor. It is divided into three classes—the wines of Basse Bourgogne (Chablis, Montrachet, etc.), Haute Bourgogne (Clos-Vougeot, Chambertin, Corton, Pommard, and Volnay), and the Maconnais and Beaujolaïs. The annual yield of the vineyards is about 4½ million gallons.

Burgundy Pitch is prepared by melting and straining the exudation from the stem of the spruce fir of Southern Europe. It is hard, brittle, reddish brown and opaque, sweet and aromatic. It is soluble in glacial acetic acid, by which the common adulterants can be detected, and is used as a basis for plasters, having a stimulating action on the skin.

Burhanpur, tn., Nimar dist., Central Provinces, India, 95 m. S.E. of Indore; was the seat of the Deccan princes of the Mogul empire until 1635; was taken by General Wellesley in 1803; and in 1860 became British territory. It contains the remains of a palace built by Akbar, and a mosque by Aurungzebe; manufactures fine cottons and brocaded silks. Pop. (1901) 33,341.

Burial. The usual mode of disposing of the bodies of the dead by inhumation or burying in the earth. The earliest legal regulation of burials in our system of law is connected with the exclusion from consecrated ground of the bodies of such as had incurred ecclesiastical censure, and in England this principle survives in the law side by side with provisions introduced solely from considerations of public health. By the English law every baptised person not a suicide, excommunicate, or a person upon whom the sentence of death has been executed, is entitled to be buried in the churchyard of his parish by a Church of England clergyman, without fee. The baptism may be of a kind recognized by any Christian sect. Before 1823, one who had committed suicide was buried at a cross roads with a stake through his body, on a coroner's warrant; but now, by the Interments Act, 1882, he may be buried, even by a clergyman of the Church of England, with any service other than the burial service of the Church of England. In the United States the burial of the dead is a civil and not an ecclesiastical function, and all persons, except such as have suffered capital punishment, are entitled to decent burial in a public or private cemetery. The duty of burying the dead rests primarily on the executor or administrator of the deceased. A husband is liable for a wife's burial, and a father for a child's; while, in default of any one else, a householder is bound to provide for the burial of a person dying in his house. Overseers and guardians of the poor must bury a pauper if no one else is liable to do so, and must bury drowned bodies left by the tide. There are stringent provisions of law respecting the time and manner of burial of persons dying of infectious diseases, and it is generally a misdemeanor to bury or otherwise put out of the way a dead body without first procuring a certificate of death from a licensed physician or, in case of sudden death, without the authority of the coroner. See CEMETERY, CORPSE, CORONER.

Burial Customs. Although burial strictly means interment, or, at any rate, conveys the idea of covering over, a brief mention may here be made of the various modes of disposing of the dead, whether under ground or otherwise. Probably the method still followed by many American Indians, by some tribes of Eskimos, and by the Tibetans, as described bv Sven Hedin, was that first practised by man—*viz.* carrying the corpse a short distance from the encampment, and there depositing it on the surface or upon a platform where it is soon dismembered by birds and animals. Similarly, the Masai, the Wakamba, and other African tribes deliberately leave the bodies of their dead to be food for the hyænas. Equally callous is the Mashona treatment of criminals; for although the command of a chief—'Throw him to the crocodiles,' or 'Give him to the hyænas'—is interpreted in the first place as an order for immediate death by a spear or a club, yet it also indicates the ultimate destiny of the corpse. The Hindu practice of committing the dead to the waters of the sacred Ganges had probably a like origin, although latterly accompanied by the most reverent rites. The same may be said of burial at sea, which, in certain phases, was nothing more than the getting rid of a corpse by tossing it overboard, but which, as practised nowadays, is a solemn and devout ceremony. Akin to these is the Malay usage, by which a man, recognizing the near approach of death, puts out in his boat alone to sea; which bears some resemblance to the Viking (man of Vik, or Scandinavian sea-rover) practice of putting a corpse aboard a ship which was set on fire, though the more usual custom was to bury it under the warrior's ship, or to build a mound over it on some sea headland. The Parsee custom is to expose the corpse on a tower, there to have the flesh devoured by vultures, thus avoiding the greater horror of putrefaction. Analogous, but not obviously with the same aim, is the method, followed by the Siberian Yakuts and the Indians of the South Pacific coast of America, of placing the dead in a covered coffin, which is then hung up between two trees. Cremation, once more coming into vogue, was formerly a widespread practice, and urns containing incinerated remains are frequently disinterred in many parts of Europe. Burial in the earth, in mounds, and in stone vaults has been, and with little variation still is, the most usual European form of sepulture. These latter modes of burial ought perhaps to be regarded as a development of the practice among mound-dwellers of leaving the body of the deceased within the mound that had once been his house, and closing the entrance. In the Aleutian Isles it was customary to close merely that compartment which has been the dead man's special retreat, while his kinsfolk continued to inhabit the other parts of the mound-dwelling as before. (See Lord Avebury's *Prehistoric Times*, 1900, pp. 124–129.) Similar in nature is the hut-burial of the Maoris and of various tribes in Africa and S. America. In some cases the corpse is merely buried underneath the floor of the hut; in other cases the door is closed, and the hut becomes a tomb. Among primitive nations it was often the custom to place beside the corpse his weapons and utensils, for use in the other world; and in the case of a chief, his wives, slaves, and steed were killed at his grave, that they might bear him company, and serve him as in this life. Faint traces of such usages still survive in the customary British ceremonial at the funeral of an officer. The Hindu *sati*, or *suttee*, is another illustration of this idea. As a rule, corpses are and have been buried lying at full length; but in many early European and in modern Eskimo interments the body is doubled up. Embalming for purposes of preservation was the process adopted by the ancient Egyptians, and in a modified form it persists to the present day. *Endocannibalism* (see CANNIBALISM) may also be regarded as a burial custom. See *Archeology*, *Barrows*, and *Mounds*.



Egyptian Funeral Ceremonies.

(*By permission from the large facsimile sheets of the 'Book of the Dead,' published by the Department of Oriental Antiquities, British Museum.*)

The upper part shows the mummy on a boat-shaped hearse drawn by oxen, the wife kneeling beside it, and a priest officiating in front. In the lower part the mummy is supported upright in front of the tomb by Anubis, the wife again kneeling; priests officiate at a table of offerings—one reads the funeral service, and one brings forward an offering; behind are mourners. The cow and calf symbolize the Rising Sun, and Heaven.

Burias, isl., Masbate prov., Philippine Is., between the S. end of Luzon and Masbate I. Area, 258 sq. m. It lies N. of an important ship passage to Manila, has two lights, and is surrounded by innumerable islets and shoals. It is mountainous, the highest point (853 ft.) being at the S. extremity, and is covered with valuable timber which has not been worked. It produces tobacco, hemp, sugar-cane, chocolate, rice, and cocoanuts. Fishing is the chief occupation, but bayones and sacks of the buri palm are manufactured, and some live stock is raised for the Manila market. Pop. (1903), all civilized, 1,627.

Buriats, a Mongol race inhabiting the district round Lake Baikal, Transbaikalia, and the south of government of Irkutsk, in Siberia. Originally nomads, they are now in part successful agriculturists. A sluggish, harmless race, they are really adherents of Shaminism, though they profess Lamaist Buddhism. They are estimated to number about 210,000.

Buridan, JEAN, a French philosopher of the 14th century, became rector of the University of Paris (1327). He was one of the most subtle dialecticians of his age, and his works consist of commentaries on Aristotle (1447–9 and 1518). 'Buridan's ass' is a phrase well known as an illustration in argument regarding free will. It supposes the case of an ass who, standing equidistant between two bundles of hay and finding difficulty in making choice of either, starves to death. His works were published by J Dullard in 1516.

Burin, tn. and port of Newfoundland, cap. of Burin dist., 125 m. S.W. of St. John's, on W. side of Placentia Bay, on an inlet which forms an excellent harbor. The chief occupations are afforded by fishing and navigation. Pop. 3,000.

Buriti, or MIRITI, PALM (*Mauritia flexuosa* or *vinifera*), two of the largest S. American fan palms (100–125 feet high), growing on swampy land from Brazil to the West Indies. From the sap the natives obtain, by fermentation, an intoxicating liquor; while the pulp of the fruit is eaten, and is preserved in sugar. The leaf fibres are used for cords, mats, etc., the pith as cork, and the stem yields a kind of sago.

Burke, EDMUND (1729–97), English statesman and political philosopher, was born in Dublin. In 1743 he entered Trinity College, Dublin. Being destined for the English bar, he proceeded to London in 1750, to attend at the Middle Temple, but he took to literature instead. In 1756 he published the *Vindication of Natural Society*, a satire upon Bolingbroke; and the *Philosophical Inquiry into the Origin of Our Ideas of the Sublime and the Beautiful*, an important contribution to the study of æsthetics. In 1757 appeared *An Account of the European Settlements in America*, written by Burke with the assistance of his cousin, William Burke. This work shows his early interest in America, and reveals his knowledge of the conditions in the colonies at that time.

When in 1759 Dodsley founded the *Annual Register*, Burke, to whom the plan of the book was due, became its editor, and continued a contributor until 1788. In 1761 he accompanied W. G. Hamilton to Ireland. 'Whiteboyism' was then breaking out, and Burke sketched a fragment on the Irish penal laws. He always advocated a generous policy toward Ireland and her religion. On his return to London (1763), he mixed in literary society, and made lasting friendships with Johnson and other members of the Literary Club, to which he was himself admitted in 1764.

Burke's public life now began. Lord Rockingham was called to the Premiership in 1765, and Burke became his private secretary. At this time Parliament was controlled by the 'king's friends,' a body of men who stood outside the old party groups, and in effect represented the parliamentary influence of the Crown. They acted under the royal orders, and were able for a time to make the king's will supreme. The disturbances arising out of the election of Wilkes for Middlesex (1768), and his rejection by the House of Commons, marked the extent of the evil; and in *Thoughts on the Cause of the Present Discontents* (1770) Burke denounced the system, and demanded a return to regular party government.

His sane and generous views on the rebellion of the American Colonies, and the disastrous policy of the ministry of Lord North (1770–82), found expression in his speeches on *American Taxation* (1774) and on *Conciliation with America* (1775), also in the *Letter to the Sheriffs of Bristol* (1777). In their union of sound statesmanship and lasting political wisdom these treatises form 'the most perfect manual in our literature for one who approaches the study of public affairs, whether for knowledge or for practice' (Morley's *Burke*). In 1771 he was appointed agent of the colony of New York, with a salary of £700, a position he held for but a short time. In 1774 he exchanged the constituency of Wendover, which he had represented since 1765, for that of Bristol; but his independent attitude in regard to the restriction on Irish trade and the relief of Catholics cost him the seat in 1780, and after that he sat for Malton (1780–94).

Burke in 1780 brought forward his *Plan of Economical Reform*, designed to check extravagance in the administrative departments. Two years later Lord Rockingham returned to power, and Burke became paymaster-general; but in three months the ministry was dissolved by the death of Rockingham. Burke and Fox refused to serve under his successor, Lord Shelburne, and by an alliance with their old enemy, Lord North, formed the coalition ministry (1783) under the Duke of Portland, in which Burke was again paymaster-general. The defeat of the ministry (December, 1783) on Fox's, or rather Burke's, East India Bill closed the latter's brief tenure of office.

His eloquent speech on the East India Bill was the prelude to his great crusade against the abuses of the East India Company. The speech on the *Nabob of Arcot's Debts* (1785), and the orations which were crowned with the impeachment of Warren Hastings (1788), reveal his profound knowledge of India.

The same reverence for established faiths and institutions urged him to write *Reflections on the French Revolution* (1790). In the proceedings of the National Assembly he saw a revolt against law and order which seemed to him to threaten an upheaval of the entire political systems of Europe. The publication of the *Reflections* proved to be an event of European importance, but in the Whig party it created a painful division, which was accentuated by the *Appeal from the New to the Old Whigs* (1792).

Burke broke off his friendship with Fox, and severed the political ties of a lifetime, but he carried with him a number of the Whigs. His hatred of the revolution grew even to frenzy, and in the four *Letters on a Regicide Peace* (1798) sobriety and good taste gave place to violent declamation. In retiring from Parliament in 1794 he was granted pensions amounting to $18,500 a year, which his lifelong pecuniary troubles made welcome. He died on July 8, 1797, and was buried at Beaconsfield, in Buckinghamshire.

Burke ranks as one of the foremost orators and political thinkers of England. He had vast knowledge of affairs, a glowing imagination which kindled everything he touched, and a wide and passionate sympathy with the most remote and unfamiliar conditions of life, as shown in his great speeches on India. His views were lucid, comprehensive, and philosophic.

Among his other works are: *Hints for an Essay on the Drama; Account of the European Settlements in America* (1757); *Abridgment of English History* (1757); *Observations on the Present State of the Nation* (1769); *Address to the King* (1776); *Two Letters to Gentlemen in Bristol* (1778); *Letter to a Member of the National Assembly* (1791); *Observations on the Conduct of the Ministry* (1793); *Remarks on Policy of Allies* (1793); *Report on the Lords' Journal* (1794); *Thoughts and Details on Scarcity* (1795); *Letter to a Noble Lord* (1795).

Burke's *Collected Works* have been published in numerous editions. Consult his *Correspondence;* Sir J. Prior's *Life* (the best); Morley's *Burke—an Historical Study*, and *Edmund Burke* (English Men of Letters Series); G. Chadwick's *Life* (1902); Pillans' *Edmund Burke* (1905).

Burke, SIR JOHN BERNARD (1814–92), English genealogist, was born in London, and was called to the bar of the Middle Temple in 1839. He succeeded Sir J. Betham as Ulster king-of-arms (1853), and was knighted in 1854. He edited for many years, in succession to his father (1847), the annual issue of *Burke's Peerage*.

Burke, MAURICE FRANCIS (1845), American Roman Catholic bishop, was born in Ireland, and was educated in Chicago and in Rome, Italy. Ordained priest in 1875, he was at St. Mary's, Joliet, Ill., from 1878 to 1887, when he was consecrated bishop of Cheyenne, Wyo. He was transferred to St. Joseph, Mo., in 1893.

Burke, ROBERT O'HARA (1820–61), Australian explorer, was born in County Galway, Ireland. He led an expedition across the Australian continent which left Melbourne in August, 1860. Dissensions early arose, and at Cooper's Creek several members returned; but Burke and Wills pushed on, and reached the tidal waters of the Flinders River. They died of starvation on their way back, but had achieved the distinction of being the first white men to cross Australia from south to north.

Burke, THOMAS MARTIN ALOYSIUS (1840–1915), American Roman Catholic prelate, born in County Mayo, Ireland, and was brought as a child to Utica, N. Y. He was graduated (1861) from St. Charles' College, Md. He studied theology at St. Mary's Seminary, Baltimore, and was ordained in 1864. The same year he was appointed an assistant at St. John's Church, Albany, N. Y., of which he became pastor in 1874, holding that position until consecrated bishop of Albany in 1894. He was also vicar-general of the diocese in 1887–94.

Burke, THOMAS NICHOLAS (1830–83), popularly known as 'Father Tom,' Irish Roman Catholic preacher, was born in Galway. He was ordained a priest in 1856, and founded the Dominican house of study at Tallagt, near Dublin. He was frequently called to Rome to preach during Lent, on account of his natural gift of eloquence. He visited the United States in 1871–3, and by his discourses in that country and Canada raised large sums of money for public charities. Interest in his visit was enhanced by a public controversy with the historian Froude, who was lecturing in the United States at the time, in regard to certain of Froude's statements concerning the Irish race. His lectures in reply to Froude were published as *English Misrule in Ireland.* Consult Fitzpatrick's *Life.*

Burke, WILLIAM (d. 1798), born in London, was a kinsman of Edmund Burke (q. v.), whom he assisted with the *Account of the European Settlements in America* (1757), and in 1759 came into notice by his *Remarks on the Letter to Two Great Men*—a reply to Lord Bath's letter to Pitt and the Duke of Newcastle. Attempts have been made to prove his authorship of the letters of Junius.

Burke, WILLIAM (1792–1829), the accomplice of William Hare in a series of infamous murders, was born in Orrery, County Cork, Ireland. In 1827 he lived in Tanner's Close, Edinburgh, in a lodging house kept by Hare. The two men used to inveigle wayfarers into their house, make them drunk, and then suffocate them in such a manner as to leave no sign of violence (this has subsequently been known as burking), with the object of selling their bodies for dissection. Burke and Hare were arrested; the latter turned king's evidence, and Burke was executed.

Burkett, ELMER JACOB (1867), American legislator, was born in Mills county, Ia. He was graduated at Tabor (Ia.) College in 1890; studied law at the State University of Nebraska; and was admitted to the bar at Lincoln, Neb., in 1893. He was a member of the State legislature in 1896–8, and of Congress in 1899–1905; and was U. S. Senator from Nebraska for the term 1905–11.

Burleigh, BENNET (d. 1914), British war correspondent, was born in Glasgow. He fought in the American Civil War, and was twice sentenced to death. After 1882 he was on the staff of the London *Daily Telegraph.* He was war correspondent during the first Egyptian War (1882), the French campaign in Madagascar, the desert campaign from Korti to Metammah, the Ashanti, Atbara, and Omdurman expeditions, the Boer War, the Russo-Japanese War, and the Italian campaign in Tripoli (1911–12). He wrote accounts of his campaigns, and *The Empire of the East* (1905).

Burleigh, or BURGHLEY, WILLIAM CECIL, LORD (1520–98), English statesman, was born in Bourne, Lincolnshire, the son of a wealthy squire. In 1547 the Protector Somerset made him master of requests, and subsequently his secretary; but when Somerset fell, Burleigh was imprisoned for two months in the Tower. His merits were so conspicuous, however, that in 1550 he was appointed secretary of state, and shortly afterward knighted. His domestic policy was salutary and enlightened. He assented to, without approving, Northumberland's scheme for altering the succession; and when Mary came to the throne he conformed to the Catholic religion, and became friendly with Cardinal Pole, although remaining at heart a Protestant. Consequently, on the accession of Queen Elizabeth, he was appointed chief secretary of state; and from 1558 till his death he practically guided the destinies of England. It was largely owing to Burleigh's sagacity, combined with the talents of the great soldiers and admirals who carried out his policy, that the age of Elizabeth became so illustrious in history.

In 1560 Burleigh went to Scotland as commissioner to end the war. His foreign policy was anti-Spanish. He desired to form a Protestant confederacy against the Catholic powers. The execution of Mary Queen of Scots he ceaselessly advised, as absolutely necessary for the safety of his own sovereign and country. He was created Baron Burghley in 1571, and Lord High Treasurer (1572), which post he held until his death. He was buried in Westminster Abbey. From his eldest son came the Exeter branch of the Cecils, and from his second son the Salisbury branch. Consult *Burghley Papers,* edited by Murdin; Macaulay's *Essay;* Nare's *Memoirs of Lord Burghley;* M. A. S. Hume's *The Great Lord Burghley;* A. Jessopp's *William Cecil, Lord Burghley* (1904).

Burleson, ALBERT SIDNEY (1863), American Cabinet officer, was born in San Marcos, Tex. He was graduated at the University of Texas in 1884, and was admitted to the bar in 1885. He acted as assistant district attorney of Austin (1885–90), and as attorney for the 26th judicial district of Texas (1891–8). He was a member of the House of Representatives from the 56th to the 62d Congress (1899–1913), where he rendered conspicuous service as a member of the Committees on Agriculture and Appropriations. He was elected to the 63d Congress in November, 1912. In March, 1913, he was appointed Postmaster-General in President Wilson's Cabinet.

Burlesque (from Italian *burla,* 'mockery,' 'jesting'), a composition treated in a way to excite laughter. Its favorite method is to set forth its subject in a ludicrous light, by emphasizing its incongruities, its oddities, its inconsistencies; but it differs from satire in that it is neither inspired nor shaped by moral condemnation or *sæva indignatio.* Burlesque is closely allied with *burletta,* a comic opera interspersed with songs, corresponding with the entertainment styled in France a *vaudeville.* Although pure burlesque originated in the time of Aristophanes, modern burlesque, so called, was an Italian invention—its two greatest exponents, Berni and Gozzi. The best of English burlesques, far behind those of Italy, are Chaucer's *Rime of Sir Thopas*, Beaumont and Fletcher's *Knight of the Burning Pestle*, Buckingham's clever ridicule of the contemporary playwriting entitled *The Rehearsal*, Smith's *Rejected Addresses*, a burlesque on the opening of Drury Lane Theatre, supposed to be written by famous writers of the time, and Butler's *Hudibras*. Scarron is perhaps the most distinguished French writer in this vein, and Cervantes, of Spain, is the author of what is probably the best burlesque ever written, *Don Quixote*. There is a distinct note of burlesque in the comic operas of W. S. Gilbert. Burnand's burlesques (*Strapmore*, *The Colonel*, *Black-eyed Susan*) also deserve mention. Parody (q. v.) is a form of burlesque. Consult Hamilton's excellent collection of *Parodies;* Adam's *Book of Burlesques;* and *Burlesque Plays and Poems*, in Morley's 'Universal Library.'

Bur'lingame, ANSON (1820–70), American diplomatist, was born in New Berlin, N. Y. He was graduated from the University of Michigan (1841) and from Harvard Law School (1846); practised law in Boston; was elected to the Massachusetts Senate in 1852, and was a representative in Congress (1855–61), first as an American or 'Know-Nothing' and later as a Republican. He was sent by Abraham Lincoln to China as U. S. minister (1861); and on his return (1867) Prince Kung, regent of the empire, requested him to act as special Chinese envoy to the United States and the great European powers. His success was marked by the treaty (1868) with the United States in which China first officially accepted the principles of international law and by similar treaties with Great Britain, Prussia, Denmark, Sweden, and Holland. He died in St. Petersburg, whither he had gone to negotiate a treaty between China and Russia.

Bur'lington, city, Iowa, county seat of Des Moines county, is situated on the Mississippi River, and on the Chicago, Burlington, and Quincy, the Chicago, Rock Island, and Pacific, the Muscatine, Burlington, and Southern, and the Toledo, Peoria, and Western Railroads; 166 miles northwest of St. Louis. The residential section of the city is built on high bluffs overlooking the river, which is spanned at this point by a railroad bridge of the Chicago, Burlington, and Quincy, and by an automobile bridge. Crapo Park, of nearly 100 acres in the southern part of the city, is famed for its beauty. Burlington has a courthouse, library, opera house, hospitals, Y. M. C. A., Y. W. C. A., and College of Commerce, and is the seat of Burlington Institute. It is a prosperous wholesale market, and manufactures furniture, mattresses, brooms, screens, tools, soap, flour, caskets, and Corliss engines, and boilers. It has also the car and engine shops of the Chicago, Burlington and Quincy Railroad. It has an important river commerce. Government is vested in a commission of five members headed by a mayor. Pop. (1910) 24,324; (1920) 24,057.

Burlington, city, Kansas, county seat of Coffey county, is situated on the Neosho River, and on the Atchison, Topeka, and Santa Fé, and the Missouri, Kansas, and Texas Railroads; 88 miles southwest of Kansas City, Kansas. It is in an agricultural region, rich also in natural gas. There are flour mills, grain elevators, cigar and carriage factories, and tile works. Pop. (1910) 2,180; (1920) 2,236.

Burlington, city and port of entry, Burlington county, New Jersey, is situated on the Delaware River, nearly opposite Bristol, Pa., and on the Pennsylvania Railroad; 19 miles northeast of Philadelphia. The city has a public library and opera house and is the seat of St. Mary's Hall for girls, the oldest church school for girls in America. Dairying and market gardening are extensively carried on and there are manufactures of canned goods, boots and shoes, stoves, carriages, structural iron, silk, and carbon paper. Pop. (1910) 8,336; (1920) 9,049.

Burlington, city, Alamance county, North Carolina, on the Southern Railroad; 21 miles east of Greensboro. Cotton, coffins, hosiery, overalls, and steel bridges are manufactured. Pop. (1910) 4,808; (1920) 5,952.

Burlington, city and port of entry, Vermont, county seat of Chittenden county and largest city in the State, is situated on the eastern shore of Lake Champlain at its widest point, and on the Central Vermont and the Rutland Railroads; 35 miles northwest of Montpelier and 300 miles north of New York. The residential section occupies a hill overlooking the lake and is well laid out with broad, tree-shaded streets. Ethan Allen Park, north of the city, has a fine tower erected in honor of Col. Ethan Allen (q. v.) and a well equipped playground. Other parks are City Hall, College, and Battery parks, the last named containing a statue of Gen. Wm. Wells. Green Mount Cemetery, overlooking the Winooski Valley, contains the grave of Ethan Allen with an imposing monument.

Important buildings are the Fletcher Library, post office, courthouse, Masonic Temple, Roman Catholic Cathedral, and Edmund's High School. Burlington is the seat of the University of Vermont and State Agricultural College, whose buildings occupy a commanding site overlooking the town. Among the finest of these are the Billings Library, Williams Science Hall, and the Medical Building. Bishop Hopkins Hall, an Episcopal School for girls, is about a mile from the city. Charitable and benevolent institutions are the Providence Orphan Asylum (R. C.), Howard Mission, Home for Destitute Children, Home for Friendless Women, Home for Aged Women, Fanny Allen Hospital, and Mary Fletcher Hospital.

Burlington has a good harbor and is connected by steamship line with other lake ports. It has a large trade in lumber, there are marble and building stone quarries near by, and cotton and woollen goods, patent medicine, furniture, spools and bobbins, confectionery, blinds, refrigerators, brushes, paper boxes, toys, and children's clothes, are manufactured. The city was settled in 1763, was a garrisoned post during the war of 1812, and was chartered as a city in 1865. Pop. (1910) 20,468; (1920) 22,779.

Burlington, city, Racine county, Wisconsin, is situated on the Fox River, and on the Chicago, Milwaukee, and St. Paul, and the Minneapolis, St. Paul, and Sault Ste. Marie Railroads; 30 miles southwest of Milwaukee. It is in a rich dairying region and includes among its manufactures condensed milk, woollen goods, bricks and tiles, blankets, and baskets. Pop. (1910) 3,212; (1920) 3,626.

Burlington, ENGLAND. See BRIDLINGTON.

Burlington House, an old mansion situated in Piccadilly, London. The original building was erected about 1695 by Richard, Lord Burlington, and was purchased, with its gardens, by the Government in 1854. New buildings were erected in the garden and a top story and façade were added to the old building. In 1866 the Royal Academy of Arts leased quarters there, and in 1868–9 a block of exhibition galleries was added. In 1872 New Burlington House, the home of the Royal, Geological, Chemical, Astronomical, and Linnæan Societies, and the Society of Antiquarus, was completed.

Burlus, bo͝or'lus, LAKE, a shallow lake in the Nile delta, east of Rosetta, Egypt; it is 40 miles long by 16 miles wide, and abounds in fish.

Bur′ma, a province of British India, stretching along the eastern side of the Bay of Bengal between 10° and 28° N. lat. It is bounded on the north by Assam and China; on the east by Yunnan and Siam; on the south by Siam; and on the west by the Bay of Bengal, except at the northwest corner, where it touches the petty states of Tipperah and Manipur. The total area of the province, including the native states, is 238,700 square miles, of which Burma proper occupies 168,573 square miles. It is 1,200 miles in length and 575 miles in width at its broadest point. See map of INDIA.

Physical Features.—The province falls into three natural divisions: Arakan, a strip of country bordering the Bay, from Cape Negrais to the Bengal Presidency, barren and hilly in the north, but rich and fertile in the south and west; the Irawadi basin forming the main division and consisting of hills and plateaus in the north, lowlands in the centre, and fertile plains in the south; the old province of Tenasserim, a narrow strip of land along the Bay of Bengal, between it and Siam, mountainous and well watered. Burma is encircled on three sides by mountain ranges; the Arakan Yomas, on the west extend northward, joining the Chin and Naga hills; the Pegu Yomas, much lower, follow a parallel course on the east; while in the south the Tenasserim hills cover practically all of the region of that name. Liklang, the highest point of the Arakan Yomas, reaches nearly 10,000 feet. The most important river is the Irawadi, nearly 1,000 miles long and navigable as far as Bhamo, 900 miles from the sea. The only other large stream is the Salwin, which flows into the Gulf of Martaban.

The climate for at least half the year is humid and depressing, due to the abundant rainfall. That of Upper Burma is typically sub-tropical, that of Lower Burma tropical. There is a wet season from June to September and a dry one from October to May. Much of the province is clothed with dense forests containing fine dye and cabinet woods, teak wood being a particularly valuable product. Palm, cocoanut, and bamboo trees abound; bananas, pineapples, and many garden vegetables are grown. The rivers teem with fish, crocodiles, and turtles, and aquatic birds are numerous. The elephant, rhinoceros, tiger, bear, leopard, and many species of deer haunt the jungles.

The extent of the mineral wealth of Burma is unknown. Petroleum is found along the banks of the Irawadi, the annual yield being nearly 300,000,000 gallons. There are important amber deposits and marble quarries, and from the ruby mines, situated about 60 or 70 miles from Mandalay, some of the finest specimens of these precious stones have been taken. Gold, silver, and coal have been discovered in the country towards the northeast, but are not yet exploited. Salt, tin, iron, lead, copper, and antimony also occur.

Industry and Trade.—Nearly three fourths of the population of Burma are engaged in agriculture. In 1918 over 15,000,000 acres were under cultivation, of which much the greatest part was devoted to rice. It is the staple food of the inhabitants and large quantities of it are exported. Other important crops are millet, sessamum, wheat, cotton, tobacco, and tea. Except for the rice mills, nearly all the manufactures of Burma are carried on in the homes. Among them are cotton and silk weaving, shawl and carpet making, wood carving, cheroot rolling, and pottery making.

Foreign trade is chiefly with Great Britain. Exports include rice, teakwood, petroleum, cotton, and precious stones, and in 1919 amounted to about $83,000,000. Imports are cotton, silk and woollen goods, sugar, and metal products, amounting in 1919 to about $35,000,000. Akyab and Rangoon are the chief seaports. Internal communication is carried on chiefly by water. The principal railway traverses the province from Rangoon to Myitkyina on the Irawadi and has several branches. Another road runs from Rangoon to Prome.

Population, Religion and Education.—The population in 1911 was 12,115,217, consisting of Burmese, Karens, Arakanese, Kachins, Talaings, Taungthus, Shans, and Chins. The Burmese are Buddhists. At Mandalay there is a small community of Mohammedans. Except among the hill tribes, little success has attended the efforts of Christian missionaries.

Burma stands first among the Indian provinces in its proportion of literates. There are many monastic schools, several government schools, and a college at Rangoon. A conservative, light-hearted race, callous of life and jealous of their faith, the people are ordinarily of a kindly disposition. Under provocation they are apt to become vindictive, and to resort to acts of revolting cruelty.

Government.—Burma is under the political control of the government of India, and is ruled by a lieutenant-governor, appointed by the Governor-General of India, with the approval of the king. For administrative purposes the province is divided into two parts—Lower Burma (81,200 sq. mi.; capital, Rangoon) and Upper Burma (nearly 87,500 sq. mi.; capital, Mandalay). The native states comprise about 68,000 square miles. Though no part of Burma can be said to be under native rule, the petty chieftains in the Shan States and in the Chin, Arakan, and Kachin hills have considerable influence over their sometimes turbulent followers.

History.—The earliest European connection with Burma was in the sixteenth century, when the Portuguese concluded a treaty (1519) with the King of Pegu, and the Dutch secured possession of the island of Negrais. About the middle of the century owing to a dispute between the Burmese governor of Pegu and the Dutch, all European merchants were expelled. British merchants returned, however, and settled in Pegu, Negrais, and Basseni. In 1795 the British found themselves called upon to repel an invasion of Bengal by Burmese troops, and this led to the first Burmese War, which began in 1824 and lasted two years. Peace was unbroken until 1852, when political and commercial complications again drove the British into war, which, however, terminated in less than twelve months. As a result the whole of the territory now known as Lower Burma passed into the possession of the crown. Upper Burma maintained its independence until January, 1886, when, gross misrule and barbarous cruelties having led to war (1885) with the Indian government, Thebaw was deposed and his kingdom annexed.

Burma: Language and Literature. Burmese, an isolating language, is composed of mere roots incapable of composition or inflection, and altered by affix and prefix into different parts of speech. It prevails throughout Burma, except in coastal villages where Talaing is taught in Buddhist monasteries. The alphabet, consisting of ten vowels and thirty-two consonants, is a circular variety of the ancient Deva Nagri, introduced from Ceylon (A.D. 450) by the Buddhist missionary Buddhagosa ('Voice of Buddha'). Buddhist doctrine, at first oral, was subsequently written in Pali, the language of the sacred books. Burmese is akin to the Tibetan tongue, and Talaing to Monda or Kól, the dialect of the aboriginal Indian tribes of the north-east—the former being soft and labial, as Italian; the latter harsh and guttural, as Arabic. The order of words in Talaing is natural, in Burmese inverted. Thus Csoma de Koros, in his Tibetan grammar, gives the order of words in the phrase 'in a book seen by me' as 'me by seen book a in.' Burmese is monosyllabic, except in words of Pali origin, and is written from left to right, without any division between the words. The symbol '5' is used before beginning an epistle, alluding to the five commandments (*Pegnytseng*), supposed to be borne in mind by the writer. Many words of similar spelling and slightly different pronunciation render the language good for punning, but difficult of acquisition. Sex is indicated by an affix, and vowels combined with consonants by symbols. In combining a noun and a numeral the genus is added. Thus, 'two oxen' is expressed, 'oxen two animals.' Burmese literature is divided into sacred and secular, the former written in Pali, the latter in Burmese. The two great metaphysical works of Indian origin are the *Bee-da-gat thoon-bon*, or *Pitakatayan* (The Three Baskets), and the *Baideng*. The former contains the three great divisions of the Buddhist scriptures, and is voluminous, being made up of *Thuttan* (The Rule), sermons of Gautama; *Winiya* (Discipline), rules for the priesthood; and *Abhidhamma* (Pre-eminent Truths), expressed in short dogmatic sayings. The *Baideng*, in four parts, one of which has been lost, treats of mathematics and astronomy, or rather astrology. The secular writings comprise chronological history, medicine, topography, ballads, and romances purer in sentiment than those of India. The drama, a national institution, is immensely popular. The dialogue is chiefly recitative, and solos, choruses, and dancing are interspersed, the music being sweet and attractive. Burmese war-boat songs are stirring and lively, the steersman (*pai-neng*) delivering the recitative, and the crew joining in the refrain, to which their oars keep time. Books, composed of leaves of the Palmyra palm joined at the ends by string, are bound between wooden covers, gilt, and lacquered in colored devices. The letters are engraved with an iron stylus, and rendered visible by means of a mixture of charcoal and fragrant gum, the latter acting as a preservative against insects. See Fytche's *Burmah, Past and Present* (1878); Wheeler's *History of India and Burma* (1880); *The British Burma Gazetteer* (1880); Mason's *Burma: its People and Productions* (1882); Phayre's *History of Burmah* (1883); Murray's *Handbook for India and Burma* (1894); Forchhammer's *Notes on the Languages and Dialects of Burma* (1884); Slack's *Manual of Burmese* (1888); *Anglo-Burmese Grammatical Reader* (1889); St. John's *Burmese Reader* (1894); Judson's *English and Burmese Dictionary* (1894).

Burmann, a learned Dutch family, of whom the most distinguished members were FRANZ BURMANN (1628–79), theologian, born at Leyden. He wrote several commentaries on books of the Old Testament. His son, PETER BURMANN THE ELDER (1668–1741), a famous member of the Dutch philological school, was born at Utrecht. He became professor of rhetoric and history at Utrecht in 1696, later of Greek literature and politics, and in 1715 professor of rhetoric at Leyden. His works, chiefly editions of the Latin classics, include *De Vectigalibus Populi Romani* (1694; new ed. 1737), *Sylloge Epistolarum* (1727), and editions of Horace (1699), Petronius (1709), Velleius Paterculus (1179) Quintilian (1720), Justin (1722), Valerius Flaccus (1724), Ovid (1727), *Poetæ Minores* (1731), Suetonius (1736), Lucan (1740).

Burmeister, RICHARD (1860), German-American pianist and composer, was born in Hamburg, Germany, and studied under Liszt, 1881–4. From 1883 to 1885 he was also occupied in giving concerts in various parts of Europe, and in the latter year was selected to take charge of the department of the piano at the Peabody Institute, Baltimore, Md. He removed to New York (1897), where he was director of the Scharwenka Conservatory for two years, and he gave concerts generally in the U. S. until his appointment (1903), as chief of the department of the piano at the Royal Conservatory of Music at Dresden. His compositions were principally for the piano, but he composed also for the voice and orchestra.

Burnaby, FREDERICK GUSTAVUS (1842–85), English cavalry officer and traveller. A man of enormous physical strength, he was especially distinguished by his extraordinary intrepidity and love of perilous adventure and of battle. His unusual knowledge of languages helped him in many adventurous journeys. He travelled in equatorial and South America; acted as *Times* correspondent with the Carlist forces in 1874; in the following year followed Gordon to the Sudan; attempting, that winter, to reach Central Asia, he 'rode to Khiva,' where he was stopped by a wire from the Duke of Cambridge. In 1876 he went 'on horseback through Asia Minor' to study Turkish administration; commanded, in 1877, a Turkish brigade in the war with Russia—always, in Burnaby's view, Britain's chief enemy; engaged in adventurous aëronautic expeditions, one of which, in 1882, was 'a ride across the Channel;' was wounded at El Teb (1884) under Graham; and in 1885 met his death from an Arab spear at Abu Klea, where he fought, under Sir Herbert Stewart, as a volunteer. See *Ride to Khiva* (1876); *On Horseback through Asia Minor* (1877); *A Ride across the Channel* (1882); also Ware and Mann's *Life* (1885).

Burnand, SIR FRANCIS COWLEY (b. 1836), English dramatic author and editor of *Punch*, from 1880 until 1906, when he resigned. He is the author of nearly one hundred dramatic pieces, chiefly burlesques and comedies. 'Mokeanna,' his first contribution to *Punch* (1868), was followed by the 'Happy Thoughts' series, containing many amusing hits on leading novelists—such as 'Strapmore,' a parody on Ouida's *Strathmore*, and issued since in book form. Among his best-known dramatic productions are *Black-eyed Susan*, *The Colonel*, and the libretto of Sullivan's opera *The Chieftain* (1894). He was knighted in 1903. In that same year appeared his *Records and Reminiscences*.

Burne-Jones, SIR EDWARD, BART. (1833–98), British artist, of Welsh descent, was born in Birmingham. A fine classical scholar, he went to Oxford (1853) to study for the church. A sudden awakening of his genius came from his friendship with his fellow-undergraduate William Morris, and with Rossetti. Thenceforth he devoted himself absolutely to art. At first he studied (1856) under Rossetti, and worked with him on the walls of the Oxford Union. Together with Rossetti and Morris he has profoundly affected the renaissance in England of decorative art proper and the artistic crafts. He designed stained-glass windows for churches in England, America, India, Germany, France; and the mosaic decorations in the apse of the American Church, Rome, are his. The earlier paintings show the influence of Rossetti; but individuality was asserted in *The Merciful Knight* (1864). During a visit to Italy in 1862 with Ruskin, Burne-Jones learnt much from Botticelli and something from Mantegna. His draughtsmanship is fine and clear; his composition shows indefatigable scholarship and exhaustless fancy; his typical figures of brooding melancholy symbolize the underlying truth of all myths —the struggle of the human soul with destiny; his color is rich and suggestive, his finish elaborate and expressive. An associate (1864) of the Royal Society of Painters in Water Colors, he resigned (1870) owing to a misunderstanding, and later was re-elected. Down to about 1875 he worked principally in water colors, but after that date most of his pictures were done in oils. In 1885 he was elected A.R.A., but exhibited one picture only, and resigned in 1893. He was created baronet in 1894. Among his paintings are *The Mirror of Venus*, *Pan and Psyche*, *The Beguiling of Merlin* (1877), *Perseus and Andromeda*, *The Days of Creation* (1877), *Love Among the Ruins*, and *The Briar Rose* (1890). The Tate Gallery possess *King Cophetua and the Beggar Maid* (1884); Manchester, the *Sibylla Delphica;* Liverpool, *Sponsa di Libano;* Birmingham, *The Star of Bethlehem* (1891), thirty cartoons for windows, and several studies and sketches. In 1903 were published a series of twenty-five designs by him entitled *The Beginning of the World*. See 'Sir Edward Burne-Jones,' by Julia Cartwright, in *Art Annual* (1894); Malcolm Bell's *Burne-Jones: Life and Work* (new ed. 1901); Ruskin's *The Art of England* (1884) and *The Mythic Art* (1883).

Burnell, Arthur Coke (1840–82), English Sanskrit scholar, born at St. Briavels, Gloucestershire. He was in the Indian civil service from 1857–68, and afterward became an authority on Sanskrit and S. Indian dialects, his principal work being *Classified Index to the Sanskrit MSS. in the Palace at Tanjore* (1880). He has also published *Catalogue of a Collection of Sanskrit MSS.* (1869), *The Law of Partition and Succession* (1875), *Brâhmanas of Sâmaveda* (1873–8), *Handbook of S. Indian Palæography* (1874), *The Aindra School of Sanskrit Grammarians* (1875). A translation of the *Ordinances of Manu* appeared two years after his death.

Burnes, Sir Alexander (1805–41), traveller in Asia, a native of Montrose, Scotland, entered the Indian army in 1821. His knowledge of languages led to his being employed as interpreter, then entrusted with special missions by the Indian government. In 1832–3 he explored, in disguise, Afghanistan, Bokhara, and Persia, and published *Travels into Bokhara* (1834), which proved very popular. In 1839 he was appointed political resident in Kabul, but two years later fell a victim to the Afghan mob.

Burnet. Perennial herbs (*Sanguisorba*) of the rose family. They have pinnate, serrate leaves. One (*S. Sanguisorba*), a salad plant of the Old World, has been naturalized in dry soil, and has globose heads of apetalous, greenish flowers. Its foliage has the taste of cucumber, and the leaves were sometimes used to flavor drinks. The American burnet (*S. Canadensis*), is a striking plant of swamps and meadows. In late summer it shoots up tall stems, often 6 ft. high, bearing long, cylindrical spikes, crowded with small flowers, which, although without petals, are made conspicuous by the much exserted stamens, that have white filaments.

Burnet, Gilbert (1643–1715), bishop of Salisbury, was the youngest son of Robert Burnet of Crimond, Aberdeenshire, and was born in Edinburgh. In 1665 he was ordained by the bishop of Edinburgh, and appointed minister of the parish of Saltoun in East Lothian, where he remained until 1669, when he was elected to the chair of divinity in the University of Glasgow. In 1672 he published his *Vindication of the Authority, Constitution, and Laws of the Church and State of Scotland.* The first two volumes of his *History of the Reformation of the Church of England* appeared in 1679–81, but the third volume was only published the year before his death. Throughout his life Burnet exercised a great influence on British politics. His fearless criticism of Charles II. and his championship of Lord William Russell so aroused the displeasure of the king that, with unkingly spite, he deprived Burnet of both his chaplaincy and his lectureship. The revolution of 1688 had no stronger supporter than Bishop Burnet, who at length accepted the episcopal dignity under William of Orange, being consecrated bishop of Salisbury in 1689. His predilections were strongly Whig and anti-Catholic. In 1701 he was chairman of the committee for the final consideration of the Bill of Rights. He supported the Act of Toleration, and opposed the 'High Church and Sacheverell' party; but his unvarying loyalty to the Church of England was nowhere more practically manifested than in his organization (1704) of Queen Anne's bounty. He was also a warm supporter of the policy of carrying out a legislative union between England and Scotland. His most famous achievement, *Bishop Burnet's History of his Own Time*, a history of great and lasting value, was not published until 1724–34, and even then not without mutilations; the first complete version was issued by Dr. Routh at Oxford, in 6 vols., in 1823 (newer ed. 1897). See the various editions of his *Histories*, the *Lives* by Le Clerc and Flaxman, Wyon's *Reign of Queen Anne*, and Guizot's *Notice sur Burnet*—a masterly criticism.

Burnet, Jacob (1770–1853), American jurist, was born in Newark, N. J., the son of a Revolutionary patriot, and graduated (1791) at Princeton. He studied law with Judge Boudinot, was admitted to the New Jersey bar in 1796, and removed the same year to Ohio, where he took a leading part in the development of Cincinnati, then a new town. He was a member of the territorial legislative council until the state government was organized, and served in the Ohio Legislature. From 1821 to 1828 he was a judge of the Supreme Court of Ohio, and he was U.S. Senator from that state, 1828–31. Judge Burnet took an active interest in the organization of Cincinnati educational institutions; and in 1821, through his instrumentality, Congress passed a law relieving the western and southwestern settlers from back interest on their enormous debt to the U. S. government, and permitting them to relinquish as much of the land entered as they were unable to pay for. He published *Notes on the Early Settlement of the Northwestern Territory* (1847).

Burnet, John (1784–1868), engraver and painter, was born at Musselburgh, near Edinburgh. He went to London (1806), where he was welcomed by Wilkie, illustrated the *Novelist*, and executed large plates of Wilkie's works—*e.g.* *The Blind Fiddler* (1806–10). He painted many landscapes; his *Greenwich Pensioners* is well known. Among his publications are *A Treatise on Painting* (1827), *Rembrandt and his Works* (1849), and, with Allan Cunningham, *Life and Works of Turner* (1852).

Burnet, Thomas (?1635–1715), master of Charterhouse, is remembered for two books, eloquent and fine in style, but fanciful in matter—*Telluris Theoria Sacra* (1681–9), an attempt to account for the shape of the earth as a gigantic egg whose shell was crushed at the deluge; and *Archæologiæ Philosophicæ* (1692), an attempt to reconcile this theory with Gen. i. See Life by Heathcote, prefixed to 7th ed. of *Theoria* (1759).

Burnett, Frances Hodgson (1849), English novelist, spent her early life in Manchester, and there gained her knowledge of Lancashire scenes and dialect. In 1865 her parent removed to the United States, and Miss Hodgson began to write stories for the American magazines. She lived in Tenn. previous to her marriage to Dr. S. M. Burnett, an oculist of Washington, but since then has lived in Washington and New York, and has also spent several years in Europe. She was divorced from Dr. Burnett in 1898 and married Stephen Townsend in 1900. She was made famous by her story 'That Lass o' Lowrie's,' published in *Scribners'*, and then separately (1877). It was followed by *Haworth's* (1879), and *A Fair Barbarian* (1881). *Little Lord Fauntleroy* appeared in 1886, and both as novel and as drama achieved exceptional success. Several of her stories have been successfully dramatized and presented in New York and other cities of the U. S.; among the number are *Esmeralda*, written in 1881 with W. H. Gillette, and *A Lady of Quality* (pub. 1896), with the help of Stephen Townsend. Other novels are *His Grace of Osmonde* (1897), and *The Making of a Marchioness* (1901).

Burnett, JAMES. See MONBODDO.

Burnett, PETER HARDEMAN (1807–95), first civil governor of Cal., was born in Nashville, Tenn., and worked as a trader and lawyer in Tenn. and Mo. until 1843, when he removed to Ore., where he served as legislator and judge, helping also to organize the territorial government. In 1848 he took part in the rush to the Cal. gold mines, and the following year assumed charge of the Sutter estate at New Helvetia, then much involved. He was an earnest advocate of statehood for Cal., accomplished in 1850, and was the new state's first governor, resigning, however, the following year to resume the practice of the law. He was a justice of the Supreme Court of Cal. (1857–8), and was president of the bank afterward known as the Pacific Bank of San Francisco (1863–80), retiring with a fortune. He published, among other books, *Recollections of an Old Pioneer* (1878), a valuable record of early days in California.

Burney, CHARLES (1726–1814), English musician, was born at Shrewsbury, and became a pupil (1744–7) of Dr. Arne; organist at Lynn (1751–60), and at Chelsea Hospital (1783–1814). Wrote a *History of Music* (1776–89).

Burney, FRANCES, MME. D'ARBLAY (1752–1840), English novelist, was born at King's Lynn, where her father, Dr. Charles Burney, was then organist. She accompanied her father to London in 1760, and at his house met the most cultured society of the day, including Johnson, Garrick, and the Thrales. *Evelina, or the History of a Young Lady's Entrance into the World,* was published anonymously in 1778. It achieved an immediate success. *Cecilia, or the Memoirs of an Heiress,* followed in 1782, with even greater *éclat*. In 1786 she became second keeper of the robes to the queen; but her health broke down under the restraint of court life, and she retired on a pension in 1791. Two years later she married General D'Arblay, a French refugee. In 1795 she produced *Edwy and Elgiva*, a tragedy, which proved a failure. *Camilla, or a Picture of Youth*, her third novel, appeared in 1796, and *The Wanderer, or Female Difficulties*, her last, in 1814. Much of her married life was spent in France (1802–12); thereafter she lived chiefly in England. Her *Diary* (published with her letters, 5 vols., in 1842 and 2 further vols. in 1846) form an almost continuous narrative from 1778 to 1800, and, in its brilliant sketches of court life and society, exhibits at their best her signal powers of satire and observation. The simplicity of theme which marked *Evelina* gave way in *Cecilia* to a more ambitious but less successful plot; and the fresh style of her earliest novel deteriorated more and more, till in the *Memoirs of Dr. Burney* (1832) all is stilted rhetoric and pompous sentiment. In 1890 Mrs. Ellis edited Fanny Burney's *Early Diary*, 1768–78, 2 vols. See Boswell's *Life of Johnson* (ed. Birkbeck Hill, 1886); Macaulay's *Essay on Madame D' Arblay; Evelina* and *Cecilia* (1881 and 1882), L. B. Seeley's *Fanny Burney and her Friends* (1895).

Burnham, HENRY EBEN (1844), American legislator; was born at Dunbarton, N. H.; graduated at Dartmouth in 1865; admitted to the bar in 1868; was judge of probate of Hillsboro co. in 1876–79; elected U. S. Senator (Rep.) for the term 1901–13.

Burnham, SHERBURNE WESLEY (1838), American astronomer, was born at Thetford, Vt., studied stenography, worked as a shorthand reporter in New York and at New Orleans, and removed to Chicago (1867), where he followed the same occupation for twenty years. As early as 1860 he procured a small telescope in London and began to educate himself as an observer. In 1869 he obtained a Clark six-inch telescope, and, favored with exceptionally clear vision, initiated his discoveries of double stars. In 1894 he was awarded the gold medal of the Royal Astronomical Society of London for his discoveries up to that year, numbering 1,274. Mr. Burnham was one of the astronomers of Lick Observatory from 1888 to 1892, resigning in the latter year. In 1897 he was associated with the Yerkes Observatory, and subsequently became professor of practical astronomy at the University of Chicago.

Burnham Beeches, a picturesque part of an ancient forest in Buckinghamshire, England. In 1900 some fine patches of the ancient forest were purchased by the corporation of London for a public recreation ground. Burnham Beeches was a favorite resort of the poet Gray. Dropmore, a seat 2 m. N.W. of Burnham village, is noted for a magnificent avenue of cedars of Lebanon, both planted by Lord Grenville. See Sheahan's *Hist. of Buckinghamshire*, p. 815.

Burnie, a port on the shores of Emu Bay, Tasmania, the terminus of the Western Ry., connecting with Launceston and Hobart. Pop. (1901) of tn. 1,548; of dist. 7,000.

Burning. See COMBUSTION.

Burning Bush, several deciduous and evergreen ornamental shrubs of the genus Euonymus and order Celastrineæ, with scarlet fruits.

Burnley, mrkt. tn., munic., parl., and co. bor., E. Lancashire, England, 21 m. E. of Preston. Ac. of parl. bor. 3,981; of munic. bor. 4,005. The public buildings include Victoria Hospital, mechanics' institution and school of science, and technical school. There are fine public parks and numerous recreation grounds. Cotton spinning and weaving, iron-founding, the making of weaving machinery, coal-mining, and stone and slate quarrying are among the chief industries of town and neighborhood. The Leeds and Liverpool and other canals facilitate transport. Pop. (1911) of munic. bor. 106,337; of parl. bor. 104,331.

Burnouf. (1.) JEAN LOUIS (1775–1844), French philologist, born at Urville, became assistant professor of rhetoric at the Lycée Charlemagne in Paris, and was soon afterwards presented to the chair of rhetoric at the Lycée Imperial, which he held till 1826. He was professor of Latin rhetoric at the Collége de France and president of the Ecole Normale (1811–22). From 1830–6 Burnouf was inspector-general of studies, and on his retirement was made librarian of the university. The *Méthode pour Etudier la Langue Grecque* (1814) and *Méthode pour Etudier la Langue Latine* (1840) are his most important works. (2.) His son EUGÈNE (1801–52), born at Paris, devoted himself to the study of Oriental languages; in 1826 published an *Essai sur le Pali*, and from that date was a constant contributor to the *Journal Asiatique* and the *Journal des Savants*. He is remembered for his deciphering of the Zend MSS. brought to Paris by Anquetil Duperron, his lithographed edition of the *Vendidad-Sadé* (1829–43), and his *Commentaire sur le Yacna* (1833–4), which first made Zoroastrianism known to the West. Other works include an edition of the *Bhâgavata Purâna* (Sans. and Fr., 1840), *Introduction a l'Histoire du Bouddhisme* (1845), and *Lotus de la Bonne Loi* (pub. posthumously, 1852). In 1832 he succeeded Chézy as professor of Sanskirt in the Collége de France, and the same year was elected a member of the Académie des Inscriptions. See *Lives* by Barthélemy Saint-Hilaire (1892) and Berger (1893). **(3.)** Emile Louis (1821), Orientalist, cousin of the preceding, published *Méthode pour Etudier la Langue Sanscrite* (1859), *Dictionnaire Classique Sanscrit-Francais* (1863–4), *La Mythologie des Japonais d'après de Koku-si-Ryakel* (1875), *Mémoires sur l'Antiquité* (1879), and *Le Chant de l'Eglise Latine* (1887).

Burns, Anthony (*c.* 1830–62), fugitive slave, was born in Va., and escaped from slavery in that state and made his way to Boston, Mass., where he was at work in the winter of 1853–4. He was discovered and arrested by a U. S. marshal in accordance with the fugitive-slave law, just at the time of the repeal of the Missouri Compromise, in May, 1854. Public feeling in Boston, already excited by the action of Congress, was violently stirred up, and a meeting was called at Faneuil Hall. Simultaneously an unsuccessful attempt was made to rescue Burns (then confined in the Boston Court-house) led by Thomas W. Higginson, who was wounded with others of the attacking party. On the following day, an examination was held by U. S. Commissioner Loring, who decided, on the evidence, that Burns must be returned to his master. Burns was sent on board a government cutter, a riot at the wharf being narrowly avoided by a clergyman's call to prayer, and the incident was ended, although it did more to crystallize public opinion in the North than any one occurrence save the hanging of John Brown. Burns afterward became a Baptist minister, and settled in Canada. See Stevens's *Anthony Burns: A History* (1856).

Burns, Sir George. See Inverclyde, Lord.

Burns, John (1858), English labor leader and M.P. for Battersea (London), began his public career as an aggressive leader of the extreme labor movement, and a prominent member of the Social Democratic Federation. In 1886 he was prosecuted for using 'seditious language and inciting to riot,' but was acquitted. The assertion of the right to hold public meetings in Trafalgar Square in defiance of the public authorities brought him (1887) a short term of imprisonment. He was, in those days, the head and front of every strike or lock-out or labor agitation of any importance in the country, and figured with special prominence in the London dock strike of 1889. He advocates the nationalization of land, railways, and mines. As a boy he worked at a candle factory and an engine works. He was working at a printing-machine establishment when he was first elected to the London County Council in 1889. He still retains his seat in that body, and sits in the House of Commons for Battersea, to which he was first elected in 1892. In 1905 he was appointed president of the Local Government Board in the cabinet of Sir Henry Campbell-Bannerman.

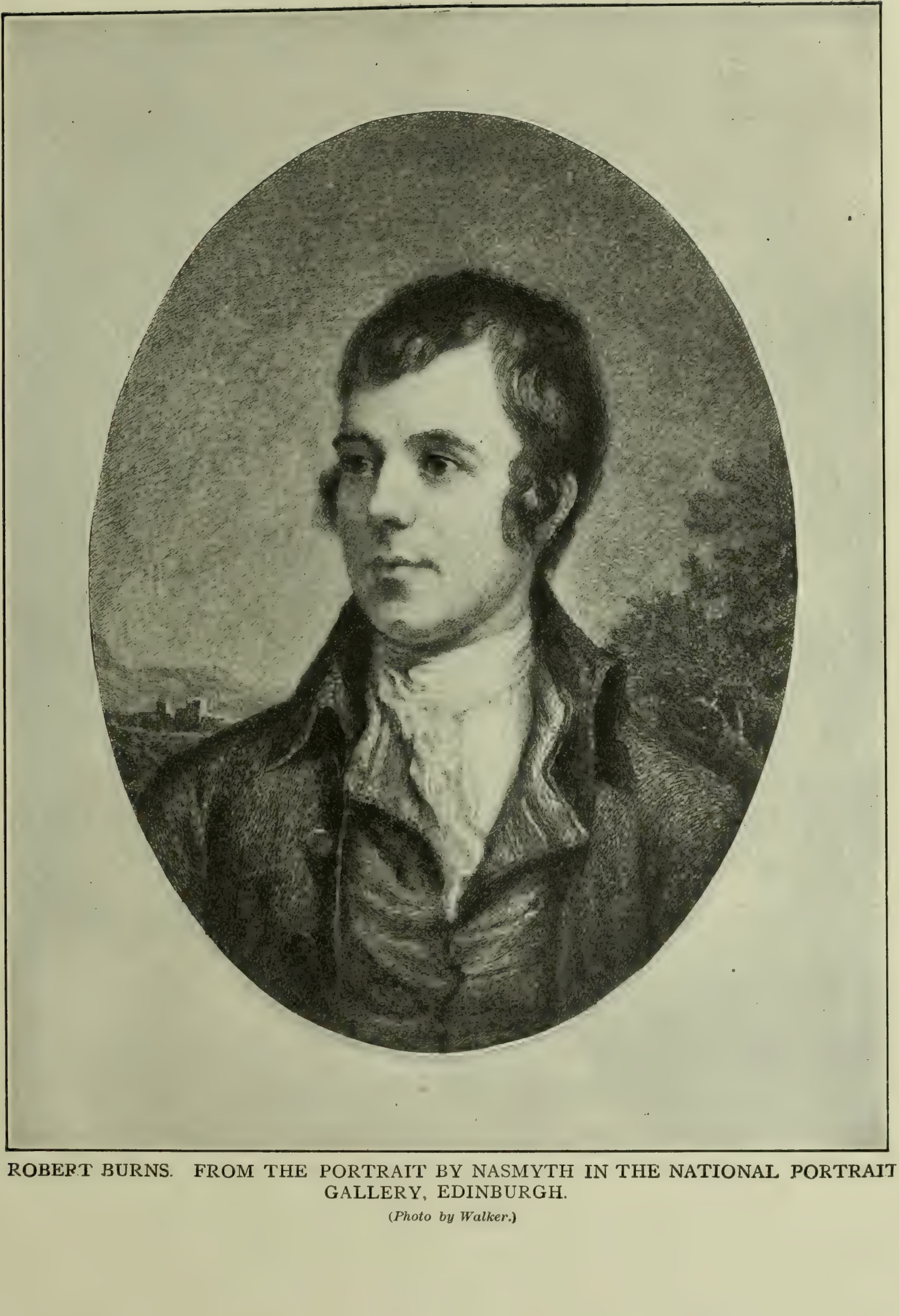
Burns, Robert (1759–96), Scottish poet, was the son of a gardener, and was born at Alloway, near Ayr, Scotland. In order to keep his family together, William Burns left Alloway, where he had tried market-gardening, when his son Robert was about seven, and took the small farm of Mount Oliphant, about two miles distant. Burns employed no servant, and his sons had to work incessantly in the fields; the hardship of his early life broke Robert's health, and produced a tendency to hypochondria.

Farming at Mount Oliphant was a heart-breaking failure; and in 1777, when the poet was eighteen, the family removed to the farm of Lochlea, in the parish of Tarbolton. Before that time a juvenile love affair and resentment at his father's hard lot had inspired him to poetical composition. At Lochlea life was easier at first. Robert read less, but mixed more freely in society, became a noted philander, and wrote verses on his loves; he was also an active member of a bachelors' club or debating society. After a brief stay in the town of Irvine for the purpose of learning flax-dressing, where he met 'acquaintances of a freer manner of thinking and living than he had been used to,' he returned to farming at Lochlea, and wrote more industriously.

On the father's death (in difficulties), in 1783, Robert and Gilbert took the farm of Mossgiel, in the parish of Mauchline, two or three miles from Lochlea. But for them, as for William Burns, farming was a losing game. Industry was of no avail against adverse circumstances, and Robert submitted more and more readily to his destiny as a poet. The song *Mary Morison* was a product of the Tarbolton period. The *Epistle to Davie* was the prelude to an output of poetry from Mossgiel, which in a year or two furnished forth the contents of that treasure of the bibliophile, the Kilmarnock Burns. The birth of an illegitimate child brought Robert under ecclesiastical discipline, and an inherited liberalism in theology impelled him to use his talent in the battle, which was then at its height, between 'Old Lichts' and 'New Lichts' (afterwards Moderates and Evangelicals) in the Church of Scotland. The result was a series of satires which brought him the friendship of a number of the liberal clergy, irritated the others, and, being circulated in manuscript, made for the poet a wide reputation for latitudinarianism. To this period belong *The Twa Herds, Holy Willie's Prayer*, the *Address to the Unco Guid, The Holy Fair*, and the *Address to the Deil.* To the winter of 1785–6 are assigned the last of these, and also *To a Mouse, Hallow E'en, Man was made to Mourn, The Cottar's Saturday Night, The Jolly Beggars, To James Smith, The Vision, The Author's Earnest Cry and Prayer, The Twa Dogs, The Ordination*, and *Scotch Drink.*

The poet had reached his full stature. Then a moral slip drove him to publication and fame. In the spring of 1786 it became necessary for him to acknowledge as his wife Jean Armour, a Mauchline girl, and in order to support her he thought of going to Jamaica to seek his fortune. To procure money for his passage, he threw the best of his work into a volume which was published at Kilmarnock in July. The Armours had previously cast him off—he was not considered good enough for the daughter of a master mason—and, according to tradition, he made love to and would have married, but for her sudden death, Mary Campbell, a Highland servant, whose personality has been a will o' the wisp to his biographers, and who was the subject of some of his most exquisite poems. But the publication of the Kilmarnock volume changed the current of his life. The gentry of Ayrshire were proud to cultivate the author; the Jamaica venture was abandoned when Jean Armour made him a father; Dr. Blacklock, the blind poet and critic, eulogized the poems in the *Edinburgh Magazine;* and before the year was out, Burns, who had made £20 by the sale of 600 copies of his book, was in Edinburgh arranging for the publication of a second edition.

He was welcomed warmly by two social sets—the literary and fashionable circle (including the Duchess of Gordon and the Earl



ROBERT BURNS. FROM THE PORTRAIT BY NASMYTH IN THE NATIONAL PORTRAIT GALLERY, EDINBURGH.

(Photo by Walker.)

of Glencairn), of which the chief ornaments were Dugald Stewart, Blair, Robertson, Henry Erskine, Henry Mackenzie, and Lord Monboddo; and another circle of lawyers' apprentices and their peers, who made for him a social habitat of the same order as he had frequented in the Tarbolton bachelors' club and Ayrshire masonic lodges. In the society of lords, judges, and professors he found himself at once at home, behaved with native dignity, and impressed all with the strength of his personality and the originality of his mind. The first Edinburgh edition of his poems was published in 1787 by subscription, and ultimately he gained some £500 by it. He spent the latter part of the year 1787 in a series of tours through Scotland and a second short stay in Edinburgh, where, the novelty of the plough-man-poet having worn off, he was less cultivated by the great; then, too, he formed a connection with a grass widow, a Mrs. Maclehose, who kept up for some time a 'Sylvander and Clarinda' correspondence with him.

In February, 1788, he went home to Mossgiel, and finding Jean Armour on the point of again making him a father, married her. He had taken a lease of the farm of Ellisland, in Dunscore parish, Dumfriesshire, and by the end of the year he was settled there. But Ellisland was as refractory a farm as Mount Oliphant. The poet sank his little capital in it without hope of redemption, and in order to live became an exciseman. The double labor of farming and 'gauging,' however, proved too severe, and by the end of 1791 he was glad to break the lease and remove to Dumfries, where he spent the rest of his life in the service of the excise. At Ellisland he wrote a great many songs, including *Mary in Heaven*, *Auld Lang Syne*, and *Ye Banks and Braes*, for Johnson's *Scots Musical Museum*, to which he had begun to contribute during his stay in Edinburgh; also *Tam o'Shanter*, *The Whistle*, and *The Kirk's Alarm*. He was a welcome guest at the tables of the Dumfriesshire lairds. On his removal to Dumfries, however, politics hurt his prospect of advancement. He had written Whig skits—*The Five Carlins*, for example—at Ellisland, and the editor of the London *Star* had offered him a permanent appointment, which he declined. He continued to produce election literature, but the French Revolution claimed his sympathy more and more. Yet on the threat of invasion he became a volunteer, and wrote *Does Haughty Gaul Invasion threat?* Tradition and unverified gossip have loaded the memory of his later years with moral declension. He died after rheumatic fever in 1796. He wrote songs to the last—for instance, *Duncan Gray* and *O wert thou in the Cauld Blast*.

Burns was the greatest of the Scotch vernacular poets, from whom—as Hamilton and Semple, through Ramsay and Fergusson—he took his forms and metres. In the vernacular he was at his best, a supreme artist in words and an unequalled song-writer. See *The Life and Works of Robert Burns*, by Robert Chambers, revised by William Wallace (ed. 1896); Henley and Henderson's *The Poetry of Robert Burns* (ed. 1896); Carlyle's *Essays*, vol. ii., (1869); Leslie Stephen, in the *Dict. of Nat. Biog.*

Burns and Scalds are considered together, as, for practical purposes, their effects are the same, and differences in treatment depend only upon the extent of injury and the amount of sepsis (bacterial infection) present or to be feared.

The danger of a burn is proportionate to its superficial extent, and depends also partly upon its position. Death may be expected if half the surface of the body is affected, even though there be no depth of tissue destroyed. Burns on the trunk are more dangerous than those on the limbs, and children succumb more readily than adults. It cannot always be said what is the immediate cause of death. Shock, no doubt, accounts for many deaths, and sepsis for others. Exhaustion following profuse suppuration is another cause; and there are cases in which death has ensued owing to the direct effect upon the blood of great heat. Another danger is deep-seated inflammation, when the seat of the burn is over important organs. There is also a risk of dangerous swelling of the tissues of the throat after swallowing boiling or corrosive fluids. Shock, and the exhaustion consequent on it, must be combated by stimulants, blankets, and hot bottles. The exhaustion consequent on suppuration, which may come later, must be met by suitable dressings, and by the continued and careful use of stimulants. When the throat and œsophagus are affected, feeding may be carried on by the stomach-tube or by enemata; and difficult respiration may require tracheotomy.

The local treatment of burns depends to some extent upon their position, depth, and extent. The aim is to counteract sepsis, or to prevent it; to relieve pain; and to prevent scarring, or, if that be impossible on account of the depth of burn, to make it as slight as possible, and to guard to the utmost against deformity by contraction. Thus, we first cleanse the burned surface with antiseptic lotion (sometimes under chloroform), and then apply suitable dressings, which are left undisturbed as long as it is safe. A burn on a limb may sometimes render amputation necessary. In cases of burns covering large surfaces, some recommend the continuous warm antiseptic bath, especially for children. Further, if the whole thickness of skin has been destroyed, attempts must be made to supply the deficiency by means of skin-grafting. The burned surface is first carefully purified, and for that purpose some use boracic lotion, some weak carbolic, while others use a two per cent. solution of picric acid. For after application, as dressing, orthoform and aristol are among the newer recommendations; but the dressing most in favor is picric acid, first advocated by French surgeons. A one per cent. solution is often enough, and that strength is practically a saturated solution. Strips of gauze, lightly wrung out in this lotion, are so placed as to cover the cleansed surface, and are themselves covered with antiseptic wool and a bandage. The dressing should be left undisturbed as long as possible, and may prove efficient for from four to six or seven days. It must be changed if suppuration soaks through, or if there are signs of sepsis. Pieces adherent should not be dragged off, but should have the picric acid solution poured on them. The part, if a limb, may be kept at rest by a splint. Picric acid is a poison, and so should be kept secure.

Burnside, Ambrose Everett (1824–81), American soldier, born at Liberty, Ind. He graduated at West Point in 1847, but resigned from the army in Oct., 1853, and devoted himself unsuccessfully to the manufacture of a breech-loading rifle which he had invented. In the Civil War he was one of the most prominent generals on the Federal side, rising rapidly in the volunteer service from the rank of colonel (May, 1861) to that of brigadier-general (Aug., 1861) and of major-general (March, 1862). He commanded a brigade in the first battle of Bull Run, organized the 'coast division,' captured Roanoke Island (Feb. 8, 1862) and Newbern, N. C. (March 14), and assumed command of the newly organized Ninth Corps, which became part of the Army of the Potomac, then under Gen. McClellan. Burnside commanded the Federal left in the battle of Antietam (Sept. 16–17), and on Nov. 7 was placed in command of the Army of the Potomac—a position which he had twice declined and for which he felt himself unfit; the appointment, indeed, is now generally considered to have been ill advised. After thoroughly reorganizing the army, he impetuously attacked Lee, then occupying a position of great strength at Fredericksburg, Va. (Dec. 13, 1862), and was disastrously defeated (see FREDERICKSBURG, BATTLE OF). While preparing for a second attack he was superseded by Hooker (Jan. 26, 1863).

Soon afterward Burnside was placed in command of the Department of the Ohio, with headquarters at Cincinnati, in which capacity he issued (April 13) his famous General Order No. 38 for the suppression of treason in any form, and caused the arrest of Clement L. Vallandigham (q. v.), the leader of the 'Copperheads.' He prohibited the circulation of books 'containing sentiments of a disloyal tendency,' forbade the circulation of the New York *World* in his department, and suppressed the Chicago *Times*. For these high-handed measures he was vigorously criticised, and his suppression of the *Times* was overruled by Lincoln. He was later besieged for some time in Knoxville, Tenn., by Longstreet, and once more at the head of the Ninth Corps of the Army of the Potomac, he took part in the Virginia campaign of 1864. Owing largely to friction with his superior, General Meade, he resigned in April, 1865.

After the war Burnside was governor of Rhode Island (1866–9) and U. S. Senator (1875–81). While in Europe during the Franco-Prussian War (1870) he acted as a medium of communication between the hostile armies. Consult *Life* by Poore.

Burntisland, bûrnt-ī′land; *locally* brunt-i′land, town, Fifeshire, Scotland, on the Firth of Forth; 20 miles by rail (*viâ* Forth Bridge) from Edinburgh. It is an important coaling port, with large docks, and a summer resort for golf and sea bathing. Pop. 4,800.

Burnt Stones, antique gems of carnelian, sometimes engraved, found in Roman ruins. They appear to have undergone firing, to make a thin surface layer semi-opaque and give them a resemblance to sardonyx (q. v.).

Bur Oak. See OAK.

Burr, AARON (1716–57), American clergyman and educator, father of Aaron Burr (q. v.), was born in Fairfield, Conn., and was graduated from Yale (1735). He was pastor at Newark, N. J., for many years, and the head of a boys' school. From 1748 until his death he was president of the College of New Jersey (Princeton College), and was its principal organizer and developer. He gained a high reputation both for his preaching and for his dignified and gracious bearing.

Burr, AARON (1756–1836), American political leader and Vice-President of the United States, was born in Newark, N. J., son of Aaron Burr (q. v.). and of Esther, the daughter of Jonathan Edwards. The boy's father died in 1757, his mother in 1758, and he was reared by an uncle at Elizabethtown, N. J. In 1766 he vainly attempted to run off to sea. In 1772 he was graduated from Princeton; and thereafter he studied, in turn, theology and law. He served with marked ability in the American Revolution; took part in Benedict Arnold's Canadian expedition (1775); rose to the rank of lieutenant-colonel (1777); and was a member first of Washington's and then of Putnam's staff (1776). He commanded a brigade in the Battle of Monmouth (1778), and from January, 1779, until his resignation from the army in March was in command of the American lines in Westchester county, N. Y.

In 1782 Burr was admitted to the bar at Albany, N. Y.; and in 1783 he removed to New York City, where he soon became a political leader, and showed himself a master of all the devious arts of the 'practical politician.' He served in turn as a member of the State assembly (1784–5 and 1798), attorney-general of New York (1789–90), and U. S. Senator (1791–7). In the national campaign of 1800 he was the candidate of the Democratic-Republican Party for the Presidency; and he and Thomas Jefferson having received the same number of electoral votes, the choice devolved upon the House of Representatives. Jefferson, largely through the aid of Federalists, influenced by Alexander Hamilton (q. v.), was chosen President; and Burr became Vice-President (1801–5). He failed to secure a renomination, and in 1804 was defeated for the governorship of New York, Hamilton, as always, vigorously opposing him. Burr, deeply angered, then forced a duel upon Hamilton, whom he fatally wounded at Weehawken, N. J., on July 11, 1804.

This rendered Burr practically an outcast in New York, where, as also in New Jersey, he was indicted for murder. On this account, and also to recuperate his fortunes, he turned to the rapidly developing West and Southwest, and devoted himself for the next two years to what has become known as the *Aaron Burr Conspiracy*. The traditional view that he planned a disruption of the Union and the establishment of a separate government in the Mississippi Valley has been largely supplanted by the more reasonable view that, with the aid of the Westerners, he intended to strike at the Spanish possessions in the Southwest, and particularly to seize and govern Mexico—a plan based in part on the belief then current that a war between the United States and Spain was imminent. Burr's conduct, however, was marked by the grossest duplicity, and in the midst of his preparations he was arrested on a charge of treason. After a notable trial at Richmond, in 1807, he was acquitted. Soon afterward he was tried on a charge of misdemeanor, and was again acquitted, the Government, in each case, exerting itself to procure his conviction.

Burr then went abroad (1808), largely to secure aid in the further prosecution of his designs. He was expelled from England; tried in vain to obtain assistance from Napoleon; and after enduring many privations and insults, returned to America (1812), and thereafter lived in New York City. He died at Port Richmond, N. Y., and was buried at Princeton.

The personality of Burr offers a curious and interesting study. Endowed with intellectual gifts of a high order, magnetic, holding men, and more especially women, with a peculiar fascination, a politician of consummate ability, he was unscrupulous, an intriguer, and a profligate in his personal habits, and his natural endowments were vitiated by his lack of moral character. In 1782 he married Theodosia Prevost, widow of a British officer, who bore him one child, Theodosia Burr (q. v.); and in 1833 he married Mme. Jumel Consult Parton's *Life and Times of Aaron Burr;* Davis' *Memoirs of Aaron Burr;* Merwin's *Aaron Burr;* McCaleb's *The Aaron Burr Conspiracy;* Adams' *History of the United States;* Tompkins' *Burr Bibliography;* Todd's *The True Aaron Burr.*

Burr, THEODOSIA (1783–1813), only child of Aaron Burr (q. v.) and Theodosia Prevost Burr, was born in New York City. She was educated by her father, and became widely known for her beauty, accomplishments, and charm of manner. She married Joseph Allston, who became governor of South Carolina. Through all the disasters which befell her father she showed intense devotion, and assisted in securing a favorable hearing for him during his prolonged trial at Richmond. She was drowned in the *Patriot*, while on a voyage to New York.

Burr, WILLIAM HUBERT (1851–), American civil engineer, was born in Watertown, Conn., and was educated at the Rensselaer Polytechnic Institute. He was professor of mechanics at Rensselaer Polytechnic Institute (1876–84), engineer of the Phoenix Bridge Company (1884–91), professor of engineering at Harvard (1891–2), and professor (1893–1916) and professor emeritus (after 1916) of civil engineering at Columbia University. He served as a member of the 1899 and 1904 Isthmian Canal Commissions, and of other Federal, State, and municipal commissions. He has published: *Stresses in Bridge and Roof Trusses* (1879); *Ancient and Modern Engineering and the Isthmian Canal* (1902); *The Graphic Method by Influence Lines for Bridge and Roof Computation* (with M. S. Falk, 1905); *Suspension Bridges, Arch Ribs, and Cantilevers* (1913).

Bur'ra, or KOORINGA, town, South Australia, on Burra Creek; 100 miles by rail northeast of Adelaide. It contains the once famous Burra Burra copper mine, discovered in 1844, now deserted. Pop. 2,600.

Burrard Inlet, 9 miles long, Strait of Georgia, British Columbia, north of the mouth of the Fraser River. Vancouver (q. v.) stands on the south shore.

Burr Conspiracy. See BURR, AARON.

Bur'rell, DAVID JAMES (1844–), American clergyman, was born in Mount Pleasant, Pa., and was graduated from Yale (1867). He prepared for the ministry at the Union Theological Seminary, and after four years' missionary work in Chicago was pastor of Presbyterian churches in Dubuque and Minneapolis. In 1891 he accepted the pastorate of the Marble Collegiate Church in New York City. He has published a number of religious volumes, including: *For Christ's Crown and Covenant* (1896); *The Early Church* (1897); *The Wonderful Teacher* (1902); *Christ and Men* (1905); *Evolution of a Christian* (1906); *The Cloister Book* (1909); *In David's Town* (1910); *At the Gate Beautiful* (1911); *The Home Sanctuary* (1911); *The Old-Time Religion* (1913); *The Church in the Upper Room* (1913); *We Would See Jesus* (1914); *The Apostles' Creed* (1915); *Why I Believe the Bible* (1917).

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Burriana, bo͝or-rē-ä'nä, town, province Castellon, Spain; 8 miles southwest of Castellon de la Plana. Vegetables, fruit, and grain, and especially oranges and melons, are exported. Pop. 14,250.

Burrillville, town, Providence county, Rhode Island, on the New York, New Haven, and Hartford Railroad; 23 miles northwest of Providence. Its chief industries are the manufacture of woollen and cotton goods. Wallum Lake is a popular summer resort. Pop. (1910) 7,878; (1920) 8,606.

Burritt, ELIHU (1811–79), American peace advocate and author, known as 'the learned blacksmith,' was born in New Britain, Conn. While working as a blacksmith he devoted his leisure to study, especially to mathematics and languages. In the latter field his range was very wide, embracing more or less Latin, Greek, Hebrew, Arabic, and other oriental tongues, and almost all modern European languages. In 1842 at Worcester, Mass., he established *The Christian Citizen*, a weekly journal devoted to the anti-slavery cause, peace, temperance, and self-culture. Visiting England (1846–9), he was one of the organizers of an international association, the 'League of Universal Brotherhood,' which aimed at the abolition of war and the promotion of brotherhood among nations. He was also instrumental in organizing the First International Peace Congress at Brussels, in 1848, and the Second at Paris, under the presidency of Victor Hugo, in 1849; and he subsequently attended various other peace congresses. In 1852 he became editor of *The Citizen of the World*, Philadelphia, in which he urged the compensated emancipation of slaves. In 1865–7 he was U. S. consul at Birmingham, England. For many years he was a prominent advocate of ocean penny postage.

Among his publications are: *Sparks from the Anvil* (1848); *Olive Leaves* (1850); *Thoughts of Things at Home and Abroad* (1854); *A Walk from London to John O'Groat's, with Notes by the Way* (1864); *A Walk from London to Land's End and Back* (1865); *Thoughts and Notes at Home and Abroad* (1868); *Walks in the Black County* (1868); *Lectures and Speeches* (1869); *Ten-Minute Talks on All Sorts of Subjects, with Autobiography* (1874); *Chips from Many Blocks* (1878). Consult *Life*, by C. Northend.

Burro, a small donkey used as a pack animal in the mountainous districts of the Southwestern United States and Mexico.

Burroughs, bur'rōz, GEORGE (*c.* 1650–92), American clergyman, was graduated from Harvard (1670). In 1676 he was a preacher at Falmouth (now Portland), Me., and in 1680–5 at Salem, Mass. He subsequently lived at Falmouth and Wells until his accusation of witchcraft at Salem in 1692, where he was charged with tormenting Mary Wolcott and others by wicked arts—a charge supported by the evidence of self-confessed witches—and was executed on Aug. 19. Burroughs was the only clergyman convicted during the witchcraft excitement, and it is presumed that his differences with his former parishioners were the occasion of his accusation and arrest. See WITCHCRAFT.

Burroughs, JOHN (1837–1921), American naturalist and writer, was born in Roxbury, N. Y., where his father was a farmer. He worked on the farm, received a common-school education, and when seventeen years old removed to Olive, in Ulster county, where he taught school for several years. He was appointed to a position in the U. S. Treasury Department at Washington in 1863, and subsequently became chief of the organization division in the bureau of national banks. In 1872 he left Washington, and two years later established himself on a farm at West Park on the Hudson, where he devoted himself to the cultivation of small fruits and the writing of his essays on nature.

Burrough's first article was published in *The Atlantic Monthly* for 1860. His first published volume, *Notes on Walt Whitman as Poet and Person* (1867), grew out of his personal acquaintance with 'the good, gray poet' at Washington, of whom he was always a supporter. It was followed by *Wake Robin* (1871); *Winter Sunshine* (1875); *Birds and Poets* (1877); *Locusts and Wild Honey* (1879); *Pepacton* (1881); *Fresh Fields* (1884); *Signs and Seasons* (1886); *Sharp Eyes* (1888); *Indoor Studies* (1889); *Riverby* (1894); *A Study* (1897); *The Light of Day* (1900); *Squirrels and Other Fur Bearers* (1900); *Literary Values* (1902); *Far and Near* (1904); *Ways of Nature* (1905); *Bird and Bough* (1906); *Camping and Tramping with Roosevelt* (1907); *Leaf and Tendril* (1908); *Time and Change* (1912); *The Summit of the Years* (1913); *The Breath of Life* (1915); *Under the Apple Trees* (1916); *Field and Study* (1919). In these books he shows himself a keen and accurate observer as well as the master of a peculiarly direct and graceful literary style. Consult Barrus' *The Retreat of a Poet Naturalist* and *John Burroughs, Boy and Man* (1920).

Burrowing Owl. See OWL.

Burrows, JULIUS CÆSAR (1837–1915), American legislator, was born in Northeast, Erie county, Pa. He served in the Civil War as an officer in the Union army, and at the close of hostilities opened a law office in Kalamazoo, Mich. He held various local offices, and was five times elected to Congress. In 1894 he was elected U. S. Senator, serving for sixteen years.

Burrstone. See BUHRSTONE.

Bur′rus, AFRANIUS, a Roman soldier of distinction under Claudius and Nero. In 52 A.D. he was appointed sole commander of the prætorian guards. With Seneca he conducted the education of Nero, and it was mainly owing to his influence that Nero was declared emperor. Burrus did his best to prevent Agrippina's cruelty after Nero's accession, and later tried to save Agrippina herself, and Octavia, from the emperor. Weary of his control, Nero caused him to be poisoned in 63 A.D.

Bur′sa, a synovial sac interposed between muscles, tendons, or skin and bony prominences, whose function it is to lessen the friction to which these parts are exposed. Bursæ are composed of a layer of dense cellular tissue, lined internally with a layer of flattened endothelial cells, which secrete a lubricating fluid called synovia. Some bursæ are constantly present, but others are developed as the result of occasional friction of muscles against each other or adjoining parts. Inflammation of a bursa is known as *bursitis,* and occurs in several forms, of which 'housemaid's knee' and 'miner's elbow' are familiar.

Bur′sar, a name given to the treasurer or subtreasurer in English and many American universities. In Scotland the term is used also for the recipient of a bursary or annual allowance similar to English and American scholarships.

Burschenschaft, bo͝orsh′en-shäft, a student organization in German universities whose aim is threefold: moral character and breeding, good fellowship, and patriotism. The first association was formed at Jena (1815). Two years later, on the occasion of a festal gathering in honor of liberty at the Wartburg, near Eisenach, certain irresponsible students burned the works of contemporary writers whose tendencies were obnoxious to them. This and the murder of the dramatist Kotzebue, in 1819, by a Jena student (Sand), led the governments of Central Europe to suppress the organizations, but they soon revived, only to be proceeded against once more in 1830–3. All special restrictions against the *Burschenschaft* societies were withdrawn in 1848, and they still flourish and are generally considered to exert a good influence in developing frankness, simplicity, and graciousness.

Bur′sera′ceæ, a family of tropical plants occurring in both hemispheres. There are more than 300 species, the best know of which is the Gumbolimbo (*B. gummifera*), a tall tree found in Florida and the West Indies, which yields a sweet aromatic balsam, known as chibou, sometimes used medicinally.

Burs′lem, parliamentary and municipal borough and market town, England, in Staffordshire, on the Grand Trunk Canal; 17 miles west of Stafford. It is in the potteries district and the making of china, glass, and porcelain is the chief industry. Features of interest are the Wedgwood Institute, opened in 1869, and the town hall with a lofty clock tower. Burslem is the birthplace of Josiah Wedgwood. Pop. (1921) 41,566.

Burstenbinder, ELIZABETH. See WERNER, ELIZABETH.

Bur′ton, JOHN HILL (1809–81), Scottish historian and author, was born in Aberdeen. He was graduated from the University of Aberdeen, studied law, and was admitted to the bar in Edinburgh, but devoted himself to literature. He contributed to the *Westminster Review,* the *Cyclopædia of Universal Biography, Blackwood's* and other periodicals, but first gained real distinction by his biography of David Hume (1846). His *History of Scotland* was completed in 1870, in 7 volumes, and some of his contributions to *Blackwood's* were published as *The Book-Hunter* (1860) and *The Scot Abroad* (1862). He was historiographer of Scotland.

Burton, MARION LE ROY (1874–1925), American educator, was born in Brooklyn, Iowa, and was educated at Carleton College, Minn., and at Yale. He was teacher of Greek in Carleton College (1899–1900), principal of Windom Institute, Minn. (1900–03), and assistant professor of systematic theology at Yale (1907–8). He was president of Smith College, Northampton, Mass., from 1910 to 1917, when he became president of the University of Minnesota. From 1920 until his death he was president of the University of Michigan. He is the author of *The Problem of Evil* (1909); *The Secret of Achievement* (1913); *Our Intellectual Attitude in an Age of Criticism* (1913); *Life Which is Life Indeed* (1914); *First Things* (1915); *On Being Divine* (1916).

Burton, RICHARD (1861–), American man of letters, was born in Hartford, Conn. He was graduated from Trinity College, Conn., in 1883, and taught in Johns Hopkins University in 1888. He was managing editor of *The Churchman,* N. Y. (1888–9), literary editor of the *Hartford Courant* (1890–7), professor of English, University of Minnesota (1898–1902), and editor for the Lothrop Publishing Company (1902–4). In 1906 he became head of the English department at the University of Minnesota, a position which he resigned in 1925 to devote himself to writing and lecturing. He is a member of the National Institute of Arts and Letters. His literary works include *Dumb in June, and Other Poems* (1895); *Memorial Day, and Other Poems* (1897); *Literary Likings* (1898); *Lyrics of Brotherhood* (1899); *John Greenleaf Whittier* (1901); *Forces in Fiction, and Other Essays* (1902); *Message and Melody—A Book of Verse* (1903); *Literary Leaders of America* (1904); *Three of a Kind* (1908); *Masters of the English Novel* (1909); *How to Know a Play* (1910); *The American Drama* (1913); *Bernard Shaw* (1915); *Charles Dickens—How to Know Him* (1919); *American Drama* (1926).

Burton, SIR RICHARD FRANCIS (1821–90), British traveller, linguist, and author, was born in Hertfordshire. Entering the East India service in 1842, he explored the Nilgiri Hills, served for five years in Sindh with Sir C. Napier, and in 1851 published his first important work, *Sind, or the Unhappy Valley,* supplemented by a volume describing the races inhabiting the valley of the Indus. Having returned to England, he set out for Arabia in 1853, and assuming the character of a wandering dervish, succeeded in reaching the holy shrines of Mecca and Medina. The account of his adventures, entitled *Narrative of a Pilgrimage to El Medinah and Meccah,* appeared in 1855–6. He next turned his attention to Africa, and after a perilous journey to Harar in Somaliland, started in 1856 with Captain Speke from Zanzibar, penetrated to the lake regions of Central Africa, and discovered Lake Tanganyika (1858). He published his *First Footsteps in East Africa, or an Exploration of Harar* in 1856, and *The Lake Regions of Central Africa* in 1860. Subsequently he was successively British consul at Fernando Po (1861), Santos in Brazil (1865), Damascus (1869), and Trieste (1871). His later publications included *Wanderings in West Africa* (1863); *Abeokuta and the Cameroon Mountains* (1863); *Explorations of the Highlands of Brazil* (1869); *The Book of the Sword* (1884); *Camoens: his Life and his Lusiads* (5 vols. 1880–84); and a new and literal translation of the *Arabian Nights,* under the title of *The Thousand Nights and a Night* (16 vols. 1885–8), of which an expurgated edition for popular perusal was issued by his wife (1886). In his later travels Burton was accompanied by his wife, Isabel, Lady Burton, who assisted him with his writings, and herself published *Inner Life of Syria, Palestine,* etc. (1875), and *Arabia, Egypt, India* (1879). Burton was knighted in 1886.

Consult Hitchman's *Early, Public, and Private Life of Sir R. F. Burton* (1887); Lady Burton's *Life of Captain Sir R. F. Burton;* Stisted's *The True Life of Sir R. F. Burton;* Dodge's *The Real Sir Richard Burton.*

Burton, ROBERT (1577–1640), English scholar, was born in Lindley, Leicestershire. He became (1599) a student of Christ Church and obtained the college living of St. Thomas, in Oxford, in 1616. About 1630 a private patron gave him that of Segrave in Leicestershire, but he continued to reside mostly in Christ Church. In 1606 he wrote a Latin comedy called *Philosophaster,* which was acted in Christ Church hall in 1618. It is a witty picture of an imaginary university (in Spain) of charlatans, and is much above the average of neo-Latin plays. In 1621 Burton published that singular medley of erudition and nonsense, the model of Sterne's *Tristram Shandy* and Southey's *Doctor,* the *Anatomy of Melancholy.*

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Burton, THEODORE ELIJAH (1851–), American legislator, was born in Jefferson, O. He was graduated from Oberlin College in 1872, was admitted to the bar in 1875, and settled in Cleveland to practise. He was member of Congress (Republican) in 1889–91, 1895–1909 and 1921– , and a U. S. Senator in 1909–15. He was chairman of the Inland Waterways Commission and a member of many important committees. He is the author of *Financial Crises and Periods of Industrial and Commercial Depression* (1902); *Life of John Sherman* (1906); *Corporations and the State* (1911); *Some Political Tendencies of the Times and the Effect of the War Thereon* (1919); *The Constitution; Its Origin and Distinctive Features* (1923).

Burton, WILLIAM EVANS (1804–60), Anglo-American actor and dramatist, was born in London, England. He made his début as an actor at the Pavilion, in London, in 1831, and in 1834 went to the United States and appeared at the Arch Street theatre in Philadelphia. His first performance in New York was given in 1837, as Guy Goodluck in *John Jones.* Of his many parts, some of the best remembered are Micawber, Sam Weller, Captain Cuttle, Mr. Toodles, Aminidab Sleek, Sir Toby Belch, Caliban, Bottom, and Falstaff. He wrote several plays, of which *Ellen Wareham* was the most successful, edited a *Cyclopædia of Wit and Humor* (1858), and founded and edited *The Gentleman's Magazine.*

Burton-on-Trent, municipal and county borough, England, in Staffordshire, on the Trent; 11 miles southwest of Derby. There are scanty remains of an eleventh. century Abbey but the town's main interest lies in its huge breweries, which have been in existence for centuries. There are more than a dozen of these breweries, employing over 7,000 people, the largest being Bass and Allsop's. There are also engineering works. Fire clay is found in the neighborhood, and plaster and cement are made. The town has frequently suffered from Trent floods. Pop. (1921) 48,927.

Burtscheid. See AIX-LA-CHAPELLE.

Buru, bōō'rōō, BURO, or BULU, island, Dutch East Indies, in the Molucca group, situated between Ceram and Celebes, and almost entirely surrounded by coral reefs; area, 3,425 square miles. It is extremely mountainous, reaching an altitude of 8,250 feet in Mount Tumahu. The principal products are cajeput oil, sago, bamboo, rattan, betel nuts, tobacco, and coffee. The capital is Kajeli. Pop. about 20,000, mostly heathen Alfuras.

Burujird, bōō-rōō-jĕrd', town, Persia, in the province of Irak-Ajimi; 70 miles southeast of Hamadan. It is surrounded by a mud wall pierced by five gates, and is a thriving business centre. The chief industry is the manufacture of printed calico, stamped with native designs, and felt goods. Pop. 20,000.

Bury, ber'i, municipal and county borough and market town, England, in Lancashire, on the Irwell; 10 miles west of Manchester. Features of interest are the Art Museum, containing the valuable Wrigley art collection, and monuments to Robert Peel and John Hay, the inventor of the fly shuttle. Once an important centre for woollen manufactures, introduced by the Flemings in the time of Edward III., Bury is now a busy cotton town, with spinning and weaving mills, calico-printing works, bleach and dye works, foundries, and engineering establishments. Coal mines and freestone quarries are numerous in the neighborhood. Pop. (1921) 56,426.

Bury, JOHN BAGNELL (1861–) Irish historian, was educated at Trinity College, Dublin, of which he was fellow from 1885 to 1902. In 1893–1902 he was professor of modern history in Dublin University, and in 1902 succeeded Lord Acton as regius professor of modern history at Cambridge. Among his numerous publications are: *History of the Later Roman Empire from Arcadius to Irene* (1889); *History of Greece to the Death of Alexander the Great* (1900); his justly-renowned edition of Gibbon's *Decline and Fall* (7 vols. 1896–1900); *Life of St. Patrick and his Place in History* (1905); *The Ancient Greek Historians* (1908); *History of the Eastern Roman Empire from 802 to 867* (1912); *The Idea of Progress* (1920); *The Hellenistic Age* (1923). He also edited the *Nemean Odes* of Pindar and Freeman's *History of Federal Government in Greece and Italy* (1893).

Bury, RICHARD DE. See AUNGERVILLE.

Burying Beetles (*Necrophorus*), insects of the family Silphidæ, so-called from their habit of making excavations under the dead bodies of small vertebrates, in order to bury them. The females lay their eggs in the buried carcasses which furnish an abundant food supply for the emerging larvæ. Burying beetles are widely distributed, particularly in the cooler zones.

Bury St. Edmunds, town, England, in West Suffolk, on the Lark; 28 miles east of Cambridge. It owes its importance to the shrine of the martyred Edmund, last king of East Anglia, which was long a noted place of pilgrimage. The Benedictine Abbey erected in the eleventh century, with its Norman Tower, a fine example of early Norman, and Moyses Hall, now a museum, are among the features of interest. The chief commercial interest of the town lies in the corn and cattle markets.

Bury St. Edmunds, or Saint Edmundsbury, as it was called in early times, was a place of importance in the Saxon period. It is said to have been the Roman Villa Faustina. It contains many interesting antiquities. Pop. (1921) 15,941.

Busa, bōō'sa, or BUSSA, town, West Africa, in the British protectorate of Northern Nigeria, on the west bank of the Niger. Near this town, in 1805, Mungo Park was drowned in the Niger. Pop. about 15,000.

Busch, bōōsh, JULIAN HERMANN MORITZ (1821–99), German publicist, called 'Bismarck's Boswell,' was a native of Dresden. In 1851 he visited the United States and, returning early in 1852, published an account of his travels in *Wanderungen zwischen Hudson und Mississippi* (1853), and *Die Mormonen* (1857). Next year he made extensive travels in the Near East, descriptions of which are to be found in *Eine Wallfahrt nach Jerusalem* (1860; 3rd ed. 1881), *Bilder aus dem Orient* (1862) and *Bilder aus Griechenland* (1863). From 1856 he was a constant contributor to the *Grenzboten,* the organ of the Nationalist party, and in 1866 entered the service of the Prussian government. Called to Berlin in 1870, he became one of Bismarck's press agents, and held this position throughout the Franco-German War. His memory rests upon his works on Bismarck, which include *Bismarck und seine Leute während des Krieges mit Frankreich* (1878), in the form of a diary (Eng. trans. 1879); *Unser Reichskanzler* (1884; Eng. trans. 1884); and *Tagebuchblätter* (Eng. *Memoirs of Prince Bismarck, 1870–93*, 3 vols. 1899), a diary kept during twenty-five years' close intimacy with the chancellor.

Busch, Wilhelm (1832–1908), German cartoonist, was born in Hanover. He first attracted attention about 1859 by his illustrations in the well known weekly, *Fliegende Blätter*, later collected as *Bilderbogen* (1875). He also wrote and illustrated a number of tales in doggerel, of which the most famous is *Max and Moritz* (1865), and published a volume of poems, *Kritik des Herzens* (1874), and a short story, *Der Schmetterling* (1893), which related how the idealist chased a butterfly and became a cripple. His works were collected and published under the title of *Humoristische Hausschatz*.

Büsching, büsh'ing, Anton Friederich (1724–93), German geographer, was pastor of the German Protestant church at St. Petersburg (1760–5), and, later, director of the gymnasium of the Greyfriars' Monastery in Berlin. His chief work is an unfinished *Neue Erdbeschreibung* (11 vols. 1754–92), from which a translation of his description of Europe was published in London (6 vols. 1762).

Büsching, Johan Gustav Gottlieb (1783–1829), German man of letters, was born in Berlin. He was royal archivist in Breslau (1811), and professor of antiquities there (1817). With Von der Hagen he edited *Deutsche Gedichte des Mittelalters* (1808–25), *Sammlung deutscher Volkslieder* (1807), *Grundriss zur Geschichte der deutschen Poesie* (1802), and other works; and alone, *Erzählungen, Dichtungen, Fastnachtsspiele und Schwänke des Mittelalters* (1814).

Buschmann, bōōsh'män, Johann Karl Eduard (1805–80), German philologist, was born in Magdeburg. After a voyage to Mexico (1827–8), he assisted the Humboldts in the preparation of their works, and became librarian of the Royal Library at Berlin (1853), and a member of the Academy of Science (1851). He is remembered for his philological researches in Malay-Polynesian and South American languages. His most important works (exclusive of those with the Humboldts) are *Ueber die aztekischen Ortsnamen* (1853), *Die Spuren der aztekischen Sprache im nördlichen Mexico* (1859), *Die Völker und Sprachen Neumexikos* (1858), *Der Athapaskische Sprachstamm* (1856), and *Das Apache und der Athapaskische Sprachstamm* (1860–63). After the death of Wilhelm von Humboldt he edited and completed that author's well known work, *Ueber die Kawisprache*, the third volume of which was entirely his own work.

Bush, Irving T. (1869–), American business man, was born in Ridgeway, Mich. He received his academic training in the Hill School, Pottstown, Pa., and at the age of nineteen entered the Bush and Denslow Manufacturing Company, of which he became secretary the following year. He early interested himself in the relief of business and traffic congestion in New York City, and in 1895 established a number of warehouses which led subsequently to the founding in Brooklyn, N. Y., of the Bush Terminal, with 123 warehouses, 8 piers, 16 industrial buildings, and facilities for receiving, storing, selling, and shipping manufactured goods. The terminal serves some 350 manufacturing and wholesale establishments.

Bush Antelope, Boschbok, or Bush Buck (*Tragelaphus sylvaticus*), a small harnessed antelope of South Africa, of which there are several varieties, hunted in bushy districts. They are brilliantly colored, with harness-like markings.

Bush-Brown, Henry Kirke (1857–), American sculptor, was born in Ogdensburg, N. Y. He studied at the National Academy of Design, New York City, and in Paris and Italy (1886–9). His works include equestrian statues of *General Meade*, *General Reynolds*, and *General Sedgwick*, and the *Lincoln Memorial*, all at Gettysburg; the *Indian Buffalo Hunt*, World's Columbian Exposition (1893); a group representing *Truth*, Pan American Exposition (1901); decorative figures in the Hall of Records, New York; statue of *General Anthony Wayne*, for Valley Forge, Pa.; *The Spirit of '61*, Philadelphia; the *Union Soldiers' Monument*, Charleston, W. Va., and the *H. B. F. Macfarland Memorial*, Washington, D. C.

Bushel. See Weights and Measures.

Bushido, the creed of the *bushi* or *samurai* (q. v.), the warrior and gentry class of feudal Japan. It required that the samurai be sober, frugal, and industrious, that he cultivate learning, loyalty, and filial devotion, and that he be willing not only himself to meet death, even by his own hand, for his country's sake, but, if necessary, to sacrifice the lives and honor of those nearest and dearest to him.

Bushire, bōō-shēr', Bushahr, Abushehr, or Bandar Bushire, seaport city, Persia, situated on the eastern shore of the Persian Gulf; 125 miles southwest of Shiraz. Originally a fishing village, it was chosen by Nadir Shah as a naval port and dockyard, and to it was transferred the East India Company's station from Gombroon. The climate is sultry, and the town suffers from lack of a good water supply. It has extensive bazaars and an important caravan trade, but the streets are narrow and dirty. The harbor is shallow, open, and unprotected. The chief exports are opium, raw cotton, carpets, tobacco, mother-of-pearl, and hides and skins. Cotton goods, sugar, tea, and spices are imported. Bushire is the seat of several European consuls. Pop. (est.) 20,000.

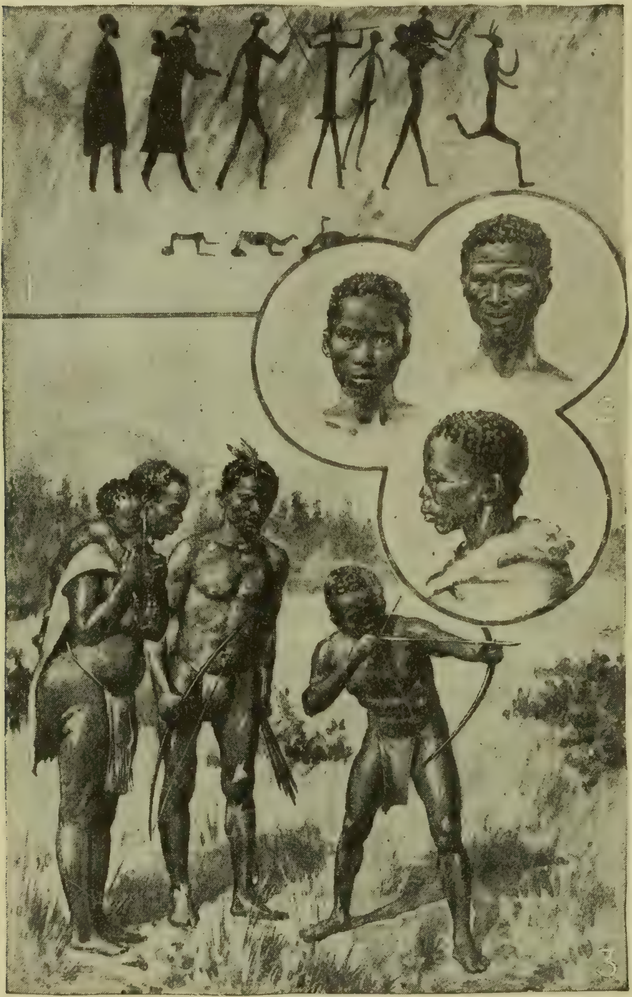
Bushmaster (*Lachesis mutus*), a large and extremely poisonous snake of Northeastern South America, closely related to the rattlesnakes, but with a spike at the end of the tail in place of a rattle.

Bushmen, native tribes formerly spreading from the Cape as far north as the Zambezi River, but at present chiefly confined to the Kalahari Desert and the northern parts of Southwest Africa. They were known to the Dutch as 'Bosjesmen,' and to the Hottentots as 'San' or 'Sonqua.' They range from about 4 feet 6 inches to 5 feet in height, are yellow-brown in color, and have black hair, flat faces, and small, narrow, slit-like eyes. They dwell mostly in caves or rock shelters and live by trapping and hunting. Their weapons of war and the chase are bows and arrows, the latter smeared with vegetable poison. The Bushmen are still savages, with no tribal organization and scarcely any household goods or permanent homes. They wear almost no clothing, and are exceedingly dirty in their habits. Their language is harsh and characterized by an abundance of peculiar sounds known as 'clicks.' Paintings and chippings found in their caves, depicting incidents of the chase, war scenes, and animal life, give evidence of a considerable degree of rude artistic talent. Consult Stow's *Native Races of South Africa;* Bleek's *Bushmen Folklore;* Dornan's *Pygmies and Bushmen of the Kalahari* (1925).

Bushnell, city, Illinois, McDonough county, on the Chicago, Burlington and Quincy, and the Toledo, Peoria and Western Railroads; 47 miles southwest of Peoria. The manufactures include carts, agricultural implements, cisterns, tanks, fencing, cigars, and bricks. Pop. (1910) 2,619; (1920) 2,716.

Bushnell, HORACE (1802–76), American theologian, was born in Litchfield, Conn. He was graduated from Yale (1827), took the divinity course there, and was pastor of the North Congregational Church, Hartford, from 1833 to 1859. His book, *God in Christ* (1849), denying the adequacy of language to express spiritual truth, brought against him a charge of heresy, which, however, was not sustained, and to which he replied in *Christ in Theology* (1851). Another important work is *Nature and the Supernatural* (1858). An edition of his works appeared in 1876–7. Consult biographies by Cheney and by Munger.

Bushrangers, a term applied in Australia to the brigands or outlaws who infested outlying settlements during the first three-quarters of the nineteenth century. The earlier bushrangers were mostly escaped convicts, who had taken to the bush, and maintained themselves by preying on lonely settlers. Later, these brigands banded together and became so serious a menace as to necessitate the Bushranging Act of 1830 (renewed in 1834), a drastic measure which put a stop to bushranging on a large scale. Among the most notorious of these desperadoes were the Kelly brothers, who began their career of crime as cattle-stealers. They pillaged Jerilderie, New South Wales, in 1879, and repeated the exploit in 1880 at Genrowan, Victoria; but were shortly after brought to bay, and though wearing coats of mail, were shot down, the leader being captured alive and afterwards hanged. Other famous bushrangers were John Whitehead, Michael Howe, Brady, and 'Mosquito.' Consult Boxall's *Australian Bushrangers;* Dunbabin's *The Making of Australasia* (1922).



Bushmen

1. Bushman drawings. 2. Types: man, boy, and woman 3 Family group

Bushwhacker, originally one accustomed to beat about or live in the woods, applied specifically in the United States, during the Civil War, to irregular troops in the Confederate States engaged in guerrilla warfare. They seldom fought in the open but confined their actions to cutting off small parties and to raiding. Kansas was the chief scene of their activity.

Business Education. See COMMERCIAL EDUCATION.

Busi'ris, a mythical king of Egypt, reputed founder of the city of Zeus, or Thebes, was killed by Hercules. Milton (*Paradise Lost,* i. 307) applies his name to the Pharaoh who was overwhelmed in the Red Sea. The name was also used of a city of ancient Egypt, now identified with the modern Abusir, in Lower Egypt, not far from Alexandria.

Busk, HANS (1815–82), English barrister, was called to the bar at Middle Temple (1841), and was high sheriff of Radnorshire (1847). He took a prominent part in the institution of the army volunteer system, the success of which was due largely to his practical treatises, especially *The Rifleman's Manual* (1858; 7th ed. 1860), *Company Drill* (1860), and *Rifle Volunteers* (1859; 7th ed. 1860). He was the first to advocate lifeboat stations, and in 1859 published *The Navies of the World,* containing suggestions for the development of the British navy.

Bus'kin, a kind of high boot laced to the ankle and lower part of the leg. In early times it was worn particularly by the actors of tragedy, whence the use of the word as a synonym for tragic drama.

Busoni, FERRUCCIO BENVENUTO (1866–1924), Italian pianist and composer, was born in Empoli, near Florence. He was educated in Austria, and at the age of fifteen made a concert tour of Italy. In 1890 he taught music at the Moscow Imperial Conservatory, and the following year began his professorship at the New England Conservatory of Music in Boston. In 1907 he succeeded for a year to the direction of Sauer's master class in piano at the Vienna Conservatory. From 1920 until his death he served as professor in the Berlin Music Academy. He was a member of the Royal Academy of Music, Bologna, and was especially known as an interpreter of the works of Bach. His compositions include chamber music, orchestral scores, and works for the piano.

Busra. See BASRA.

Bussa. See BOUSSA.

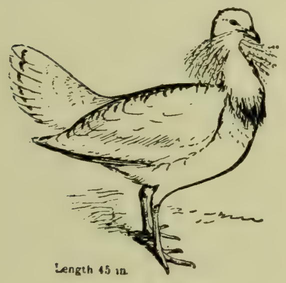
Bussanga. See BORGU.

Bussey, bus'i, BENJAMIN (1757–1842), American merchant and benefactor, was born in Canton, Mass. He served in the Revolutionary army, and at twenty-two established himself as a silversmith at Dedham, Mass. In 1782 he removed to Boston and entered the foreign trade, in which he amassed a fortune said to have been equal to $350,000. He bequeathed all of this to Harvard, after the death of certain relatives, one-half for the endowment of a school of agriculture and one-half for the support of the law and theological schools. In accordance with the terms of his bequest the Harvard authorities in 1869 established a school of practical agriculture and horticulture on Mr. Bussey's former farm at Jamaica Plain.

Bussora. (BASSORA). See BASRA.

Bust. See SCULPTURE.

Bus'tard, a name applied to birds of the family Otididæ in general, but especially to *Otis tarda*, the Great Bustard, which is one of the largest of land birds, the wing span being eight feet or more. It still exists in the central and southern parts of Europe, in North Africa, and in Asia. Other varieties include the Little Bustard (*O. tetrax*), the Long-beaked Bustard (*Eupodotis*), the Hubara (*Hubara undulata*) of Northern Africa, and the Pink-collared Bustard (*Heterotetrax vigorsi*). The birds are hunted for their excellent flesh.


Length 45 in.

Great Bustard

Busto Arsizio, bōōs'tō är-sēd'-zi-ō, town, Italy, in the province of Milan, 20 miles northwest of Milan. In the church (1517–22) is a fine altar-piece by Gaudenzio Ferrari. Linen and cotton goods are manufactured. Pop. 18,000.

Bus Transportation, the public conveyance of passengers in the modern automotive highway motor coach or motor omnibus. It is difficult to determine when the first motor bus was used. In 1829 a steam omnibus was patented in England by Walter Hancock, and he was one of the first persons to run a steam carriage for hire. In 1833 there were 20 steam carriages built, or in process of construction, in London alone, but the hostility of stage-coach drivers, breeders of horses, farmers, and others, resulted in laws unfavorable to this new mode of transport, and further development was prevented.

In France, Amédée Bollée built a twelve-passenger steam car in 1873, and an improved omnibus, *La Nouville*, in 1880. This last vehicle in 1895, in the famous race from Paris to Bordeaux and return, made the 745 miles in 90 hours and 3 minutes.

The real development of the motor bus did not come about, however, until the introduction and perfection of the gasoline motor. The first motor bus to be operated on a regular schedule in America was put in service on Fifth Avenue, New York City, in 1907, by a company which had commenced operations with horse-drawn stage coaches in 1885, and which in 1926 was operating a fleet of about 400 motor coaches. Except for the Fifth Avenue buses, and their counterparts in London, Paris, and other cities, there were comparatively few important bus operations prior to 1920.

The years following 1910 saw the introduction in many American cities, of the so-called 'jitney bus,' taking its name from the five-cent fare usually charged. This was usually a five- or seven-passenger touring car, frequently bought second-hand by the operator. It differed from the taxicab in that it ran ostensibly on a regular route. In most cases, there was at first little regulation, and when control by the public authorities was established, and bonds and other evidences of responsibility were required of the operators, the jitney usually disappeared.

The first motor buses, beside the New York Fifth Avenue coaches, had a body or passenger-carrying compartment, patterned somewhat after a street-car, holding about twelve or fifteen passengers, and mounted on a motor truck chassis. An earlier development had been the sight-seeing car with cross seats, with or without a top, and differing in design chiefly as the vehicle was used in cities or over longer interurban routes. The modern bus may be said to represent a combination of earlier bus design with the idea represented in the sight-seeing car.

The essential feature of the bus of the present is that it is in most respects a distinctive vehicle as compared either with the pleasure automobile or the motor truck. Thus, in the motor and chassis design, there are required more weight, power, and sturdiness than are available in the pleasure car, and more flexibility, speed, and comfort than are permissible in the usual truck. Bus chasses and motors are manufactured, however, by builders of both pleasure cars and trucks, as well as by concerns that specialize in bus manufacture. The bodies are often supplied separately.

There are now three recognized types of buses, designated respectively as the school, street-car, and parlor-car types. The school buses are mostly adaptations of earlier designs. The street-car type, as the name indicates, is designed for urban service and the parlor-car type for interurban or long distance service, although in the present stage of the art the designs are not as yet clearly defined, nor are the buses always used in the designated service. Buses of the street-car type are usually higher off the ground than those of the parlor-car type; the body also is higher, and so arranged as to permit standing and more ready entrance and exit. Besides being more elaborately outfitted, the parlor-car types are designed for greater speed; they may have less aisle space to allow for wider and more comfortable seats, and the low centre of gravity, desirable in the interests of speed, does not usually allow a body of such height as to make standing feasible. Some buses have cross seats with separate doors for each seat. Others have seats facing forward, two on each side of an aisle or two on one side and one on the other. Some of the street-car buses have seats extending along either side of the vehicle, or a combination of cross and longitudinal seats. Dining-car service is offered on a few long-distance runs. There are also available for the enterprising operator, vehicles equipped with observation platforms. Double-deck buses are in use for city operation in New York, Chicago, Philadelphia, and other cities, and there are instances of long-distance double-deck bus operation. (For illustration see MOTOR CARS.)

The capacities of buses range within fairly wide limits. Buses of the street-car type accommodate from 16 to 29 passengers, averaging about 25; the parlor-car buses from 10 to 33, the more common number being 25 to 29. The double-deck bus usually has about 60 seats.

The bus motors may be four- or six-cylinder. A new feature is the so-called gas-electric bus, having a gasoline motor which drives an electric generator. Current from the latter is used to operate motors directly connected with the two rear wheels. Greater flexibility of operation, more even acceleration, and increased economy of operation are claimed for such vehicles. Four-wheel brakes are sometimes used, as are also brakes operated by air. Six-wheel buses—two wheels forward and four in the rear—are made by one company, while another company has proposed to build buses with eight wheels arranged like the wheels of a railway car.

It has been estimated that there were in service in the United States on Jan. 1, 1926, a total of 70,000 buses, as compared with 60,000 a year earlier. Of these, about 32,000 were owned by independent, common-carrier bus operators or bus-operating companies. About 27,000 were used by schools. Hotels owned about 1,000, and sight-seeing and tourist companies about 2,500. There were 1,100 devoted to industrial use, including real estate, department store, garage and factory service. Railroad terminal companies carrying passengers from one large station to another operated about 250. Electric railways operated 5,358 buses and the steam railroads about 375. The number of passengers carried in 1925 was estimated to be over 4 billion. The rapid growth of the industry was further shown by the production, in 1925, of 17,500 buses.

An interesting feature in connection with bus operation is the operation of such vehicles by the street railways. At the beginning of 1926, according to estimates by the *Electric Railway Journal*, there were operated by street railways, or in their interest, 5,358 buses, as compared with 2,462 at the beginning of 1925 and 1,200 at the beginning of 1924; the number of companies operating buses on January 1, 1926, was 251, or 35 per cent. of the total number; the total mileage of street railway bus routes on Jan. 1, 1926, was 13,000, and the number of passengers carried in 1925 was 800 million. Passengers on the street railways in the same year totalled about 16 billion. The Public Service Railway of New Jersey, then operating 809 buses, was the largest bus operator in the country, and the third largest in the world, being exceeded only by the London General Omnibus Company and the *Compagnie générale des omnibus de Paris.*

Bus operations of street-railway companies have been classified as follows: (1) Extensions into unserved territory which has developed some distance from the rail facilities; (2) replacement of trolley service on routes where the revenue is low and where large expenditures would be required for track and overhead rehabilitation; (3) between terminals where the highway offers a shorter route than the rail line which was built along a circuitous route to serve the greatest amount of intervening territory.

The policy of the street railways in regard to bus transportation is expressed in a statement by the Executive Committee of the American Electric Railway Association in which they declare that though no medium has yet been developed which can alone take the place of the electric railway, there is a place for the bus as an auxiliary and in some cases a substitute for electric lines; and state their conviction that electric railways supplying such service should be protected against competition, should be regulated by law as common carriers, and should bear proportionate taxes and other public obligations fairly chargeable to them as public carriers.

The steam railroads have not thus far engaged extensively in bus operation. Bus operation by steam railways began in 1923 with small operations of two railroads. The New York, New Haven & Hartford, which now owns about 100 buses, began operations on a small scale in September 1925. Its policy at that time, as stated to the Massachusetts Department of Public Utilities, was as follows:

Where the operation of the motor coach thus becomes desirable or necessary, it will, so far as practicable, be operated: (*a*) as an extension of and in connection with rail service, making connections with important trains that may be desirable in the public interest; (*b*) parallel with and as feeders to rail service, thus enabling the rail service to be scheduled more rapidly and in consequence to become more attractive to the public; (*c*) for the filling of rail schedule intermissions where highway operation is justified but where passenger traffic is too light or freight switching too heavy to justify gas rail cars, and where through the operation of the highway service, these gaps in the rail schedule can be filled, and (*d*) for a highway service, connecting with the rail service so far as practicable, between certain populous centres where the rails handle passenger travel, but between which the construction of new or the improvement in old highways has now created a situation in which the operation of the motor coach offers the only means of regaining former revenues now lost, and of more directly combining the two forms of transportation.

The operation of buses is so new that methods of public regulation are not yet fully developed. Legal means by which buses could be operated on highways, for hire, and between fixed termini were first determined in Massachusetts in 1916, in Connecticut in 1921, and in Rhode Island in 1922. Street railways were permitted to operate buses in Massachusetts in 1920, in Connecticut in 1921, and in Rhode Island in 1922. Steam railways in these States were not given authority to operate buses until 1925.

Most of the States have established some method of public regulation. The more common practice places this with the State public utilities commission, from which the prospective bus operator is required to procure a certificate of public convenience and necessity. The commission is empowered to alter or cancel such certificates, and has supervision over fares, schedules, and service. In most States having such regulation, the filing of an indemnity bond is required. In several of the States, permission of the municipalities through or in which the buses operate is a requisite. Up to January 1926 there was no regulation of interstate bus operations, the U. S. Supreme Court having held that the establishment of such regulation is a function only of Congress. A bill establishing interstate regulation, having the approval of the steam and street railway organizations, the bus operators, and the National Association of State Railroad and Public Utilities Commissioners, was then pending in Congress.

See MOTOR CARS. Consult Hauer and Scrogg's *Bus Operating Practice;* Grupp's *Economics of Motor Transportation; Bus Transportation* (periodical); *Electric Railway Journal; Railway Age.*

Busuanga, bōō-swäng'ä, one of the Philippine Islands, in the Calamianes group. See CALAMIANES.

Butan. See BHUTAN.

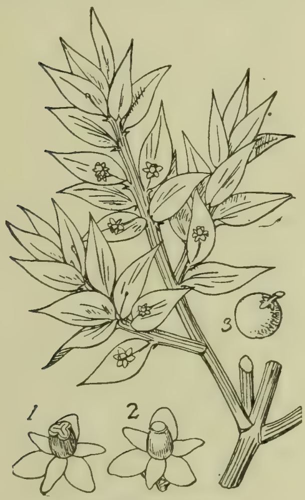
Bu'tane, either of two isomeric paraffins having the formulæ $CH_3CH_2CH_2CH_3$ and $CH_3CH(CH_3)_2$. They are both inflammable gases, the first condensing to the liquid state at 1° C., and the second at 17° C.

Butcher, SAMUEL HENRY (1850–1910), professor of Greek at Edinburgh University (1882–1903), was born in Dublin. He published *Prose Translation of the*

Odyssey, with Andrew Lang (1889); *Demosthenes* (1881); *Some Aspects of the Greek Genius* (1891, 1893); *Aristotle's Theory of Poetry and the Fine Arts, with a Critical Text and Translation of the Poetics* (1895, 1897); *Harvard Lectures* (1904).

Butcher Bird, a shrike (*Lanius*), so-called from the habit of impaling prey on thorns as butchers hang up meat. See Shrike.

Butcher's Broom (*Ruscus*), the popular name for a few species of European diœcious shrubs of the order Liliaceæ. *R. aculeatus* is interesting on account of its leaf-like stems, on which the flower appears. The fruit is a bright red berry, which when roasted has been substituted for coffee. The plant was formerly used by butchers to sweep their blocks.



Butcher's Broom

1. Male flower. 2. Female. 3. Berry.

Bute, būt, an island in the Firth of Clyde, Scotland, 15½ miles long and from 1½ to 6½ miles wide, with an area of 47 square miles. The surface is mostly grassy and hilly, with a few woods and plantations. The climate is mild, and the people are engaged chiefly in agriculture and fishing. Pop. (1921) 19,465.

Bute, John Stuart, third Earl of (1713–92), British statesman, said to have been the most unpopular minister who ever held office in England, was born in Edinburgh. He entered the service of Frederick, Prince of Wales, in 1747, and became groom of the stole to the son (George III.) of that prince in 1751, early acquiring great influence over him. Upon the accession of George III. Bute became the agent of the king in his opposition to Pitt, and after that statesman's fall he succeeded to the office of prime minister (1762) till he was forced by popular feeling to retire (1763). The responsibility for the desertion of Frederick the Great, for the peace of 1763, and for the initiation of a new policy towards the American colonies, was not his, however, but his royal master's. Bute was a patron of literature, and gave Johnson an annuity of £300.

Butea, bū'tē-*a*, a genus of Indian and Chinese shrubs or small trees of the order Leguminosæ. The leaves are trifoliate and of a velvety texture, and the large flowers are deep scarlet in color. The resinous sap forms a gum of astringent qualities known as Bengal kino, and the seeds furnish an oil used as a vermifuge. The best known species (*B. frondosa*), called the Dhak Tree, grows to a height of 50 feet; the coarse fibrous material from the inner bark is used for caulking boats; the dried flowers furnish a yellow or orange dye.

Bute'shire, county of Scotland, comprising the islands of Bute, Arran, the Cumbraes, Pladda, Holy Isle, and Inchmarnoch; area 139,658 acres. Rothesay is the capital. Pop. (1921) 33,711.

Butler, city, Pennsylvania, county seat of Butler county, on Conequenessing Creek, and on the Baltimore and Ohio, the Bessemer and Lake Erie, the Buffalo, Rochester and Pittsburgh, and the Pennsylvania Railroads; 28 miles north of Pittsburgh. The town is the centre of a rich oil, gas, coal and iron region, and has foundries, flour and steel mills, and manufactures of oil-well supplies, carriages, paints and varnish, farm lighting plants, railroad cars and equipment, gas engines, and white lead. According to the Federal Census for 1919, industrial establishments number 77, with products valued at $44,476,790. Pop. (1900) 10,853; (1910) 20,728; (1920) 23,778.

Butler, Alban (1711–73), Roman Catholic biographer, was educated at Douay, where he became professor of philosophy and of divinity. From 1768 until his death he was president of the English College at St. Omer. His monumental work, *The Lives of the Saints*, the result of thirty years labor, was published in 1756–9. After his death appeared his *Moveable Feasts and Fasts* (1839), *Meditations and Discourses* (1791–3), and *The Life of Sir Tobie Matthews* (1795).

Butler, Amos William (1860–), American ornithologist and sociologist, was born in Brookville, Ind., and was graduated from Indiana University. He was a founder of the Indiana Academy of Science, became its president in 1895, and was ornithologist to the Indiana State department of geology and natural resources in 1896–7. He filled several important offices in the American Association for the Advancement of Science. From 1897 until 1922 he served as secretary of the Indiana Board of Charities. He published *The Birds of Indiana, A Century of Progress of Charities and Correction in Indiana*, and papers on sociology and natural science.

Butler, Benjamin Franklin (1795–1858), American lawyer, was born in Kinderhook Landing, N. Y. He studied law with Martin Van Buren, and in 1817 was admitted to the bar. He was district-attorney of Albany county (1821–4), was a commissioner to revise the statutes of New York (1825–7), served in the legislature and in other public capacities, and from 1833 to 1838 was U. S. attorney-general under President Jackson. In 1836–7 he was also acting secretary of war, and from 1838 to 1841 was U. S. district-attorney for the southern district of New York. He prepared the plan for organizing the law department of the University of New York, and was its principal professor from 1837. Butler was for many years an influential Democrat, but left the Democratic party at the time of the repeal of the Missouri Compromise and thereafter voted with the Republicans. He was a thorough scholar and a distinguished lawyer. Some of his addresses were published as *Outlines of the Constitutional History of New York* (1847).

Butler, Benjamin Franklin (1818–93), American political leader and soldier, was born in Deerfield, N. H. He was graduated from Waterville (now Colby) College (1838), and was admitted to the bar (1840). On the outbreak of the Civil War he became a brigadier-general of U. S. volunteers (April, 1861), and in May 1861 was made a major-general. He was at first in command at Baltimore, was then (May, 1861) transferred to the command at Fortress Monroe, and there received fugitive slaves into his lines, justifying their retention on the ground that they were 'contrabands of war.' Early in 1862 he commanded the land forces which accompanied Farragut in his expedition against New Orleans, and, after the surrender of that city, assumed command there (May 1, 1862), remaining in practically absolute control until superseded by General Banks on Dec. 17. His administration was vigorous and in many respects able, but he was charged, apparently with good reason, with having corruptly aided his brother in the latter's illegitimate commercial speculations; he also angered the whole South by his notorious 'woman order' of May 15, which directed that 'when any female shall by word, gesture, or movement, insult or show contempt for any officer or soldier of the United States, she shall be regarded and held liable to be treated as a woman of the town plying her avocation.' This order aroused indignation in Europe as well as in America, especially in England, where it greatly increased the difficulties of Minister C. F. Adams. After Butler's summary execution (June 7) of W. B. Mumford, who had hauled down the U. S. flag, President Davis issued a proclamation (Dec. 23, 1862) calling Butler 'an outlaw and common enemy of mankind,' and directing that, if captured, he, or any commissioned officer serving under him, should be hanged without trial. This proclamation led Secretary Stanton to discontinue (Dec. 28) the exchange of commissioned officers. Subsequently (1864) Butler commanded the Department of Virginia and North Carolina, until he was relieved (Jan. 7, 1865) at the request of General Grant. After the war he was a Republican representative in Congress (1867–75 and 1877–9), being a leader in the impeachment trial of President Johnson. In 1879 he rejoined the Democratic party; in 1882–3 was governor of Massachusetts; and in 1884 was the presidential candidate of the Anti-Monopoly and Greenback parties, receiving a popular vote of 175,370. Consult his *Autobiography and Personal Reminiscences: Butler's Book* (1892); Parton's *General Butler in New Orleans* and Rhodes' *History of the United States from the Compromise of* 1850

Butler, Charles (1750–1832), English Roman Catholic and legal writer, a nephew of Alban Butler, continued and completed Hargrave's edition of *Coke upon Littleton.* His philological and biographical works (5 vols. 1817) contain dissertations on political and legal as well as ecclesiastical subjects, and his valuable letter-books are preserved in the British Museum. For many years he conducted an agitation to enlarge the freedom of English Catholics, but he was successfully opposed by Bishop Milner. Consult his *Reminiscences.*

Butler, Charles (1802–97), American lawyer, brother of B. F. Butler (1795–1858), was born in Kinderhook Landing, N. Y. He studied law with his brother and Martin Van Buren, at that time partners, was admitted to the bar in 1824, practised in Lyons and Geneva, N. Y., and was for some time assistant district-attorney for Genesee county. He removed to Chicago (then Fort Dearborn) in 1833, and there laid the foundations of his fortune by buying land afterwards included within the limits of the city. He repeated the operation at Toledo, O., returning to New York City in 1835, where he subsequently busied himself with the development of Western railways. He was a founder (1835) and a liberal benefactor of the Union Theological Seminary, was for many years a member of the council of the University of New York, and interested himself in other educational and charitable institutions.

Butler, Charles Henry (1859–), American lawyer, was born in New York City, and was graduated (1881) from Princeton University. He practised law in New York for many years, and in 1898 was legal expert for the Anglo-American commission for the delimitation of the Alaskan boundary. In 1902 he was appointed reporter of decisions to the U. S. Supreme Court. He resumed the practice of law in Washington in 1916. He is the author of *Cuba must be Free* (1898), *The Voice of the Nation* (1898), *Our Relations with Spain* (1898), *Our Treaty with Spain* (1899), *Freedom of Private Property on the Sea* (1899), and *The Treaty-making Power of the United States* (1902).

Butler, Elizabeth Southerden, Lady, English military painter, daughter of Thomas J. Thompson, was born in Lausanne, Switzerland, and was married (1877) to Major-general Sir William Francis Butler. Among her works are *Missing* (exhibited Royal Academy, 1873), *Roll Call* (1894, purchased by Queen Victoria), *Balaclava* (1876), *Inkermann* (purchased for £3,000 by the Fine Art Society, 1877), '*Listed for the Connaught Rangers* (1879), *Scotland for Ever* and *Defence of Rorke's Drift* (1881), *Floreat Etona* (1882), *Evicted* (1890), *The Camel Corps* (1891), *Halt in a Forced March* (1892), *Dawn of Waterloo* (1895), *Steady the Drums and Fifes* (1896), *Tent Pegging in India* (1902), *Rescue of Wounded* (1905); *A Cistercian Shepherd* (1908). Her writings include: *Letters from the Holy Land* (1903) and *From Sketchbook and Diary* (1909).

Butler, Ellis Parker (1869–), American author, was born in Muscatine, Iowa. His writings include: *French Decorative Styles* (1906); *Pigs is Pigs* (1906); *The Incubator Baby* (1906); *Great American Pie Co.* (1907); *Confessions of a Daddy* (1907), *Cheerful Smugglers* (1908); *Thin Santa Claus* (1909); *Adventures of a Suburbanite* (1911); *Red Head* (1916); *Dominie Dean* (1917); *Philo Gubb* (1919).

Butler, Henry Montagu (1833–1918), English educator, master of Trinity College, Cambridge (1886–1918), was born in Northamptonshire. He was senior classic (1855) at Cambridge, headmaster of Harrow (1859–85), dean of Gloucester (1885–6), and vice-chancellor of Cambridge University (1889 and 1890). In 1912 he was appointed chaplain in ordinary to the king. Among his works are several volumes of sermons, *Ten Great and Good Men* (1909); *Lord Chatham as an Orator* (1912); *Some Leisure Hours of a Long Life* (1914).

Butler, James. See Ormonde, Earl of.

Butler, James Glentworth (1821–1916), American clergyman, was born in Brooklyn, N. Y. He studied divinity at the Union Theological Seminary and the Yale Theological School, and was pastor of a Presbyterian church in West Philadelphia, Pa., from 1852 to 1868, and of a church in Brooklyn, N. Y., from 1871 to 1873. After 1874 he devoted himself to the preparation of his commentary, *Bible Works,* in eleven volumes (1874–93).

Butler, John (?–1794), American soldier, was born in Connecticut. He commanded the Indians under Sir William Johnson in the Niagara campaign of 1759, and the Montreal expedition of 1760. He sided with the British in the Revolutionary War, and, after several minor raids, led the British force at the Wyoming Valley massacre (1778), and is said to have countenanced the most atrocious cruelties. At the close of the war, he sought refuge in Canada. His American property was confiscated, but he was liberally compensated by the British government.

Butler, Joseph (1692–1752), English theologian and apologist, was born at Wantage in Berkshire. In 1718 he became preacher at the Rolls Chapel, London, where he delivered the *Fifteen Sermons,* published in 1726. In 1721 he became a prebendary of Salisbury Cathedral. The bishopric of Bristol was conferred upon him in 1738, and that of Durham in 1750. About 1741 he suggested a plan for the establishment of bishops in the American colonies, which was, however, not adopted, although in 1763, some ten years after his death, his plan was again brought into notice by a controversy between Secker and the Rev. Dr. Mayhew of Boston. Butler's fame rests on *The Analogy of Religion, Natural and Revealed to the Constitution and Course of Nature,* which was published in 1736. In it he seeks to show that the results of observation of the facts of nature fall in with the belief in a moral governor, for which our consciences call—*i.e.*, that there is an 'analogy' between nature and what he calls natural religion. He further maintains that the facts of observation are consistent with the Christian 'revealed religion'; but in this phase of the question his arguments undoubtedly lack the cogency which characterizes his *apologia* proper.

An acute criticism of Butler's reasoning, from the agnostic point of view, will be found in Leslie Stephen's *English Thought in the Eighteenth Century*. Consult Gladstone's edition of Butler's *Works* (new ed. 1910).

Butler, MATTHEW CALBRAITH (1836–1909), American soldier and legislator, was born near Greenville, S. C. He distinguished himself as a Confederate cavalry leader; losing a leg at Brandy Station (1863), and opposing Sherman in South Carolina (1865); and rising from the rank of captain to that of major-general. He served in the State legislature (1866–77); and was a member of the U. S. Senate (1877–89), where he advocated enlargement of the U. S. Navy and civil service reform. During the Spanish-American War (1898–9) he was a major-general of volunteers, and after its close a member of the Cuban evacuation commission.

Butler, NICHOLAS MURRAY (1862–), American publicist and educator, was born in Elizabeth, N. J. He was graduated from Columbia University in 1882 (A.M., 1883; PH.D., 1884), and studied in Berlin and Paris. He was successively assistant in philosophy (1885–6), tutor (1886–9), adjunct professor (1889–90), and dean of the faculty of philosophy and education (1890), at Columbia University; and since January, 1902, has been both professor of philosophy and education and president of the University. He was a delegate to the Republican National Conventions of 1888, 1904, 1908, 1912, 1916, 1920, and 1924; chairman of the New York Republican Convention in 1912; received the Republican electoral vote for Vice-President in 1913; and was presented as candidate for President at the Republican National Convention of 1920 by the New York delegation, receiving 69½ votes. He was made an officer of the French Legion of Honor in 1906 (commander in 1912 and Grand Officer 1921), and has been honored by numerous other foreign governments. He is a member of the American Academy of Arts and Letters.

Dr. Butler has edited several educational series, and founded and edited *The Educational Review*. His published works include: *The Meaning of Education* (1898; new ed. 1915); *Education in the United States* (1900); *True and False Democracy* (1907); *The American As He Is* (1908); *Philosophy* (1911); *Why Should We Change Our Form of Government?* (1912); *The International Mind* (1913); *What is Progress in Politics?* (1913); *A World in Ferment* (1918); *Is America Worth Saving?* (1920); *Building the American Nation* (1923).

Butler, PIERCE (1866–), American public official, was born in Dakota county, Minnesota. He was graduated from Carleton College, Northfield, Minn., in 1887 and was admitted to the bar in 1888. He was assistant (1891–3) and county (1893–7) attorney of Ramsey county, Minn., and after two years of general practice, became general attorney for the Chicago, St. Paul, Minneapolis, and Omaha railroads. He was counsel for the U. S. government in the prosecution of the Chicago meat packers for violation of the Sherman Act and in 1922 was appointed an associate justice of the U. S. Supreme Court.

Butler, SAMUEL (1612–80) English poet, was born in Strensham, Worcestershire, and was educated at Worcester Cathedral School. His first occupation was that of secretary to Mr. Jefferies, Earl's-Croome, Worcestershire, where he gained the friendship of the painter Samuel Cooper. He was next in the household of the Countess of Kent (1628), his duties associating him with John Selden; and then in the service of Sir Samuel Luke, a stern Presbyterian, and one of Cromwell's officers. After the Restoration he was secretary to the Lord President of Wales, under whom he was appointed steward of Ludlow Castle (1660). The legend that Butler was secretary to Buckingham when chancellor of Cambridge is scouted by Dr. Johnson, whose attitude is strengthened by the bitter tone of the 'Duke of Bucks' in the poet's posthumous *Characters*.

Butler published the first part of his famous *Hudibras* in 1663, the second in 1664, and the third in 1678, and in the end he had not finished his ridicule of fanatical Puritanism. Ostensibly a narrative, the poem owes nothing to the story. Its greatness rests on its droll, irresistible satire. It is a storehouse of pungent criticisms, terse epigrams, and wise saws, which have passed into the language of daily life. *Don Quixote*, the *Satyre Ménipée*, Cleveland's verses, and the *Musarum Deliciæ* were all probably sources of inspiration; but direct and forcible originality everywhere prevails. *The Elephant in the Moon*, *Cat and Puss*, and other works have merit, but fall far below *Hudibras*.

Butler died in Rose Street, Covent Garden, of consumption, and was buried in the churchyard of St. Paul's. In 1721 a monument was erected to him in Westminster Abbey. Aubrey described him as 'strong set, high colored, a head of sorrel hair, a severe and sound judgment—a good fellow.' Consult Johnson's *Lives of the Poets* and Henry Morley's *Character Writings of the Seventeenth Century*.

Butler, SAMUEL (1835–1902), British author, was born in Nottinghamshire, and spent several years of his early life in New Zealand. He exhibited a number of paintings at the Royal Academy (1868–76), and published several musical compositions; but his fame rests on his literary work. In 1872 he published *Erewhon*, a paradoxical Utopia abounding in humor and irony, in which he satirized the Darwinian theory; and in 1901 a sequel, *Erewhon Revisited*. He also wrote: *The Fair Haven* (1873); *Life and Habit* (1877); three other attacks on the Darwinian theory—*Evolution Old and New* (1877), *Unconscious Memory* (1880), and *Luck or Cunning* (1883); *Alps and Sanctuaries of Piedmont* (1881); *Ex Voto* (1888); *Life of Bishop Butler* (1896); *Authoress of the Odyssey* (1897); *Shakespeare Sonnets* (1899); *The Way of All Flesh* (1903), and *Essays on Art, Life, and Science* (1904)—the last two appearing posthumously. He translated the *Iliad* and the *Odyssey*.

Butler, SIR WILLIAM FRANCIS (1837–1910), British soldier and author, was born in Suirville, Tipperary. He served under Wolseley in Natal (1875) and in the Sudan campaign (1884–5); was brigadier-general in Egypt (1890–3); and was raised to the rank of major-general, and received a command at Aldershot (1893). He was commander of the troops at Cape Colony in 1898–9, but was recalled before the South African War because his views on the Transvaal difficulty were not 'Imperialist.' In 1877 he married Lady Elizabeth Butler (q. v.). He published: *The Great Lone Land* (1872); *The Wild North Land* (1873); *Akimfoo* (1875); *Far Out* (1880); *Red Cloud the Solitary Sioux* (1882); *The Campaign of the Cataracts* (1877); *Charles George Gordon* (1889); *Sir Charles Napier* (1891); *Life of Sir George Pomeroy Colley* (1899); *From Naboth's Vineyard* (1907).

Butler, WILLIAM ORLANDO (1791–1880), American soldier and political leader, was born in Jessamine county, Ky. He served in the War of 1812, taking part in the western campaign and the

Battle of New Orleans, for which he was brevetted major. Resigning from the army in 1817, he practised law at Carrollton, Ky., and was a member of Congress in 1839–43. In the Mexican War he served as major-general of volunteers; was second in command to General Taylor at Monterey, where he was severely wounded (Congress voting him a sword for gallantry); and from February to May, 1848, commanded the U. S. Army in Mexico. In 1848 he was the Democratic candidate for the Vice-Presidency. In 1861 he was a member of the Peace Congress at Washington. He published *The Boatman's Horn, and Other Poems.*

Butler, ZEBULON (1731–95), American soldier, was born in Lyme, Conn. He was in command of Forty Fort in the Wyoming Massacre (July 3, 1778); accompanied General Sullivan on his expedition against the Indians in 1779; served in the French War; and was a colonel in the American Revolution.

Butler College, a coeducational, non-sectarian institution, under the control of the Disciples of Christ, situated in Indianapolis, Ind., and chartered in 1850 as the Northwestern Christian University. Its title was changed to Butler College in 1896, when it entered into affiliation with the University of Indianapolis. In addition to the usual college courses it has a Preparatory Department, Schools of Music and Art, and a Summer School. The Indiana Law School and Indiana Dental College are associated with Butler College. For recent statistics see Table of American Colleges under COLLEGE.

Buto, bū′tō, an Egyptian goddess, specially honored at Buto, northeast of Sais, her oracle being one of the most celebrated in Egypt. She was identified by the Greeks with Leto, the mother of Apollo. Her older name was Uto, and she was represented as a serpent, sometimes with wings, and wearing the red crown of Lower Egypt.

Butomus. See FLOWERING RUSH.

Buton, bo͞o-ton′, island of the Dutch East Indies, southeast of Celebes and separated from it by Tioro and Wowoni Straits. It is over 100 miles long and has an area of about 1,600 square miles. Pop. 100,000.

Butt, ARCHIBALD WILLINGHAM (1866–1912), American soldier, was born in Augusta, Ga., and was graduated from the University of the South. He received a commission in the regular army in 1901, and served as quartermaster in the Philippines, at Washington, D. C., and at Havana. He acted as personal aid to President Roosevelt (1908–09) and to President Taft (1909–12), and was made a major in 1911. He lost his life in the *Titanic* disaster (q. v.).

Butt, CLARA (1873–), English contralto, was born in Southwick, Sussex. She made her début at the Albert Hall, London, in 1892, where she was received with enthusiasm; studied in Paris under Bouhy and Gerster in 1895; and in 1900 married Kennerly Rumford, a baritone singer, with whom she subsequently appeared in concert work.

Butt, ISAAC (1813–79), Irish political leader, was born in Glenfin, County Donegal. A successful barrister, he offered strong opposition to Daniel O'Connell; but about 1852 his political opinions changed, and in 1871 he was chosen leader of the Home Rule party. He wrote: *The Transfer of Land by Means of a Judicial Assurance* (1857); *Home Government for Ireland* (1874); *The Problem of Irish Education* (1875).

Butte, biūt (Western United States), a knoll or isolated hill, the result of erosion, usually located in an arid or semi-arid plain, and therefore conspicuous for some distance. In California the term also signifies a high mountain.

Butte, largest city in Montana, county seat of Silver Bow county, on the Butte, Anaconda and Pacific, the Chicago, Milwaukee and St. Paul, the Great Northern, the Northern Pacific, and the Oregon Short Line Railroads; 73 miles southwest of Helena, the State capital. The Yellowstone Transcontinental Trail, the Vigilante Trail, and the Banff to Grand Canyon and National Park Highway all pass through Butte. It is situated in a picturesque region of the Rocky Mountains on the slopes of the continental divide at an altitude of 5,700 feet. Public institutions and buildings include the State School of Mines, public library, business college, high schools, Federal Building, churches, public and parochial schools, and several hospitals.

Extensive copper, gold, silver and zinc mines make Butte one of the greatest mining centres of the world, with an approximate annual production of 350,000,000 pounds of copper, 230,000,000 pounds of zinc, 50,000 ounces of gold. An idea of the magnitude of mining operations is conveyed by the fact that while Butte has on the surface 253 miles of streets, her underground workings aggregate no less than 2,700 miles. According to the U. S. Census of Manufactures for 1919, Butte has 115 industrial establishments, with $4,018,888 capital and products valued at $5,261,592. Pop. (1900) 30,470; (1910) 39,165; (1920) 41,611.

Butter is the product obtained by churning milk (q. v.) or cream, and working the mass to remove the constituents other than fat (q. v.). Physically it is composed of a very great number of minute fat globules, which coalesce in churning and working but always hold a certain amount of moisture containing in solution traces of casein, sugar, and salt (qq. v.). The size of the fat globules varies greatly with the breed of cows, but it is estimated that a pound of butter contains from 720,000,000 to 180,000,000,000 of these globules.

Butter varies considerably in chemical composition, the most variable constituent being the moisture, which naturally affects the percentage of fat. An average composition may be said to be 12 per cent. of water, 84 of fat, 1 of casein, albumin, and sugar, and 3 of salt and other mineral matter. The percentage of water is quite largely in the control of the maker, and ranges from 7 or 8 up to 25, and even more. The food standards proclaimed by the U. S. Department of Agriculture call for not less than 82.5 cent. of butter fat in butter, which would admit of not more than 15 per cent. of water.

Butter fat is made up of ten component fats, and is easily decomposed in spite of all known methods of preservation. It is almost completely digestible, and is especially adapted for human food. While butter can be made by churning the fresh milk, it is difficult to make a good product in that way, and in practice the cream is used. There are two general methods of separating the cream from the milk: (1) the gravity method, and (2) the centrifugal method.

(1) The *gravity method* is based upon the fact that the fat globules, being lighter than other constituents of the milk, tend to rise to the top on standing. The milk is placed in shallow pans, where it is allowed to stand for from eighteen to twenty-four hours, or is set in tall, narrow cans which are immersed in cold water. Cooling increases the difference in specific gravity between the fat and the milk serum (as the remainder is called), and makes the creaming more rapid and complete.

(2) The modern method of creaming now generally used in large dairies and creameries is the *centrifugal method,* in which the fat is removed by means of the cream separator. The fresh milk runs in a steady stream into a bowl which is revolving at the rate of 4,000 to 6,000 turns a minute, or more, and the force it is subjected to throws the heavier part, the water,

casein, etc., to the circumference, and collects the fat in the centre of the bowl. The skim milk and the cream, thus separated, are removed by means of tubes placed in the proper position, the operation being continuous. Hand-operated separators skim from 175 to 350 lbs. of milk an hour, and the power machines up to ten times the latter amount. In careful work the skim milk contains only about 0.05 per cent. of fat.

The cream may be churned at once, making sweet-cream butter, which is mild in flavor and does not keep long; or it may first be 'ripened,' the more common practice. The ripening process is one of carefully controlled fermentation and is usually accomplished by the addition of a 'starter' containing the desired organisms but no injurious forms. The cream is sometimes pasteurized before the starter is added. When the proper amount of acid has developed, the cream being kept meanwhile at a temperature of 60–70° F., the actual churning is done. This consists in subjecting the cream to violent agitation, so that the fat globules are collected in a granular mass. The butter is then washed, salted, worked, either by hand or with a butter worker, and made into prints or packed in tubs or boxes for the market. Some harmless coloring matter is usually added.

The quality of butter depends upon the feed given the cows, the season of the year (which affects both the feed and the fermentation of the cream), the care of the milk, the stage of lactation of the cows, and the skill of the butter maker. Scrupulous cleanliness in the stable and the dairy or creamery is essential. Even butter which is of good quality when fresh may develop an undesirable flavor if it is kept too long under unfavorable conditions. Stored in cool places, preferably in refrigerators, at temperatures of zero or lower, it may be kept for months.

The butter made at creameries is of more uniform and usually better quality than that made on farms. The creamery system has spread rapidly in all parts of the country, and a larger amount of butter is now made in factories than on farms. Much of the country-made butter is unfit for use, or does not find ready market, and is 'renovated,' and sold under the law as 'process' or 'renovated' butter. It is melted, clarified, and treated by mechanical and chemical processes which remove the rancidity and obnoxious flavors, and is then re-churned with the addition of a little milk or cream to give it flavor. It is produced under government supervision to insure the employment of wholesome materials and processes. Other commercial substitutes for butter are oleomargarine, butterine and nut butters. Oleomargarine (q.v.) is a mixture of various animal and vegetable fats, churned with milk to impart a butter flavor. Butterine is oleomargarine mixed with more or less butter. The name, however, has no standing in law and is often applied to straight oleomargarine.

Nut butters are made of finely ground nuts, with or without the addition of water, oil, and salt, and have a homogeneous consistency similar to true butter. They are rich in fat and therefore easily become rancid.

Butter is one of the most important sources of fat in man's diet, as well as one of the most palatable and most digestible. It possesses a further superiority over other fats used as food in that it contains a considerable amount of Vitamin A (see VITAMINS). It supplies about 3,500 calories per pound. It is more wholesome raw than when heated, as in cooking.

Butter making has developed rapidly in the United States, spreading from New England and New York to the North-Central States, where the greatest centres of production are now found. More than 1,700,000,000 lbs. of butter are produced annually in this country, valued at nearly $500,000,000 and requiring the milk of about 12,000,000 cows. Other important butter-producing countries are Canada, Denmark, the Netherlands, Argentina, and Australia.

Consult Wing's *Milk and its Products;* Guthrie's *The Book of Butter* (1918); Walker-Tisdale's *Butter and Cheese* (1920); Hunziker's *The Butter Industry* (1920).

Butter, ROCK, or MOUNTAIN, a combination of alum and iron, soft and greasy to the touch, and having the appearance of butter, which exudes from aluminiferous rocks.

Butter-and-Eggs, a common name for the Yellow Toadflax (q.v.).

Butterbur, or BOG RHUBARB, popular name of *Petasites vulgaris,* a genus of Compositæ, introduced into America from Europe, growing in swampy ground in Eastern Massachusetts and Eastern Pennsylvania. The attractive pink flowers borne on short, thick, erect stalks, appear in April and May, before the broad rhubarb-like leaves.

Buttercup, a name applied to various species of Ranunculus with cup-shaped, glistening yellow flowers. See RANUNCULUS.

Butterfield, DANIEL (1831–91), American soldier, was born in Utica, N. Y. He was graduated from Union College in 1849 and entered the express business in New York City. At the outbreak of the Civil War he was colonel of the 12th New York militia and led his regiment to the front. He served with the Army of the Potomac, was wounded at the battles of Gaines Mills and Gettysburg, and served with such distinguished gallantry that he was commissioned colonel in the regular army, and brevetted major-general, U. S. A. He was in command of the forces in New York harbor (1866–9), and afterward was in charge of the U. S. sub-treasury in New York City (1869–70). He subsequently re-entered commercial life. He is the author of *A System of Calls, Picket and Outpost Duty, Corps Badges and Flags.*

Butterfield, KENYON LEECH (1868–), American educator, was born in Lapeer, Mich. He was educated at Michigan Agricultural College, and after serving as editor of various agricultural publications, was president and professor of political economy and rural sociology at Rhode Island College of Agriculture and Mechanical Arts (1903–06). In 1906 he became president and head of the division of rural social science, Massachusetts Agricultural College, and in 1924 resigned this position to accept the presidency of Michigan Agricultural College. In 1904–16 he was collaborator in charge of the agricultural division, Department of Economics and Sociology, Carnegie Institute, Washington, D. C. His publications include *Chapters in Rural Progress; The Country Church and the Rural Problem; The Farmer and the New Day; A Christian Programme for the Rural Community.*

Butterfish, a local name for the harvest fish and some others which are noted for fatness. In England this name is given to a blenny, the gunnel (*Centronotus gunnellus*), very common in shore pools, on account of the elongated, slippery form, which makes it exceedingly difficult to catch.

Butterflies, a group of insects which, together with the moths, constitute the insect order Lepidoptera. They are known as Rhopalocera and are distinguished from the moths, which they closely resemble, chiefly by their club-shaped antennæ (for illustration, see MOTHS), absence of the hook-and-eye arrangement of interlocking wings characteristic of many moths, and the position of the wings (erect with the two upper surfaces in proximity) at rest. They are generally diurnal in habit, while most moths are nocturnal.

The body of the butterfly consists of three parts: the head, the thorax, and the abdomen. The head is globular, bearing large compound eyes, between which are the antennæ or 'feelers,' which probably serve as organs of hearing and smell. The oval thorax consists of three closely united segments, to which are attached the three pairs of legs and the two pairs of wings. The abdomen consists of nine segments (ten in the male), the last carrying various appendages, mainly sexual in nature. The wings, which vary greatly in shape and size, are covered with beautiful scales, diversified in form and color.

Butterflies are both polymorphic and dimorphic; they display forms of albinism and melanism, and possess in large degree the quality of mimicry (q.v.). They are found almost everywhere, even in the high mountains of the colder regions, but most of them thrive best in the sunshine and warmth of the tropics and in temperate regions. Their life history is divided, as in most insects, into the period of incubation in the egg, the larval or caterpillar stage (see CATERPILLAR), the transformation into the pupa or chrysalis, and the final emergence as the imago, or perfectly developed insect.

The butterflies may be divided into five principal families, as follows: the Nymphalidæ, Lemoniidæ, Lycænidæ, Papilionidæ, and Hesperiidæ. The Nymphalidæ, or 'brush-footed' butterflies, form the largest of these families, containing as many as 5,000 species and having many subdivisions. The first pair of legs in butterflies of this family is either atrophied or greatly reduced in size and is carried folded on the thorax. Familiar species of Nymphalidæ are the Milkweed Butterflies, Fritillaries, Tortoise Shells, Painted Ladies, and Admirals. The Lemoniidæ, or 'metal-marks,' are confined chiefly to the tropics of the New World. They are rather small and brilliantly colored, with unusual spots and markings. The Lycænidæ include some of the gayest and most attractive members of the butterfly world. Among them are the well known 'Blues,' 'Coppers,' and 'Hair Streaks.' The Papilionidæ or 'swallow-tails' are a large family characterized by six perfect legs in both sexes. They include the largest species of butterflies; white, yellow and orange are the prevailing colors. The Hesperiidæ or 'skippers' are small stout insects possessing, with few exceptions, two pairs of spurs. They are found chiefly in South America and in many of their habits resemble the moths.

Consult French's *Butterflies of the Eastern United States;* Holland's *The Butterfly Book;* Soule's *Caterpillars and their Moths;* Kellogg's *American Insects;* Miller's *Butterfly and Moth Book*; Dickerson's *Moths and Butterflies;* Weed's *Butterflies Worth Knowing* (1917); Eltringham's *Butterfly Lore* (1923).

Butterfly Fish, a carnivorous fish of the tropical seas, belonging to the family *Chætodontidæ.* There are nearly 200 species, brilliantly colored and of great agility. The body is small, strongly compressed, and covered with small, smooth scales. Most of the species are of importance as food fish.

Butterfly Orchis, the popular name of two European orchids, *Habenaria bifolia* and *H. chlorantha.* The flowers of *H. bifolia* are usually white, tipped with green, while those of *H. chlorantha* are of a pale greenish tint. *Oncidium papilio,* a large West Indian orchid, is also known as the butterfly orchid.

Butterfly Orchis

1. O. papilio. 2. H. chlorantha. 3. H. bifolia.

Butterfly Weed, ORANGE MILKWEED, or PLEURISY ROOT (*Asclepias tuberosa*), a North American plant of the milkweed family, flourishes in dry and sandy fields. It has stout, hairy stems, bearing lanceolate leaves and terminal corymbs of brilliant, orange-colored flowers (June to August), which are haunted by brown and yellow butterflies. The large tuberous root has medicinal qualities, being used as an expectorant, diaphoretic, and tonic in rheumatism, pleurisy, and bronchitis.

Buttermilk, a by-product resulting from the churning of cream to make butter. It consists of the milk remaining after the fat is removed, and its composition is approximately as follows: fat, 5 per cent., casein, 2.4 per cent., albumin, 6 per cent., lactose, 5.3 per cent., ash, 7 per cent., and the remainder, water. Chemically it differs little from skim-milk. It is often prepared by the use of commercial cultures, and is considered a pleasant and nutritious beverage.

Butternut (*Juglans cinerea*), a large American tree belonging to the family Juglandaceæ. It is a short-trunked tree with spreading branches and rough grey bark, found along the Atlantic coast as far south as Georgia and westward to Dakota and Arkansas. The wood, dark yellow in color, takes a fine polish, and is used in cabinet work; the bark yields a brown dye, and the sap is sometimes added to maple sap in sugar making. The brown-husked, rugged nuts contain oil, and have a delicious flavor. When green, they are sometimes pickled as a table delicacy. For illustration, see JUGLANS.

Butter Tree, a name applied to various tropical trees, the pulpy fruit and seeds of which yield a quantity of oily fat used by the natives of India and Africa as butter and lamp oil, in soap-making, and for other commercial purposes. Most of so-called butter trees belong to the genus *Bassia,* the more important being *B. latifolia* and *B. longifolia* of India, from whose nuts mahwa butter, much used for cooking, is obtained; *B. parkii,* yielding shea butter, used both as an article of food and in the manufacture of soap and candles; *B. butyracea,* the source of ghee butter. See BASSIA.

Butter Weed. See ERIGERON.

Butterwort, popular name of *Pinguicula,* a genus of plants belonging to the Bladderwort family. They occur commonly

Butterwort

in bogs and among wet rocks in various parts of the world. The Common Butterwort (*P. vulgaris*), abundant in the temperate zone, is a small plant with radical, yellowish-green, fleshy leaves covered with small glands secreting a sticky digestive fluid by which insects are retained. The lovely blue, white, or lilac-colored flower is borne on a tall stalk rising from the centre. Butterwort has the power of coagulating milk; hence, perhaps, the name.

Butterworth, HEZEKIAH (1839–1905), American author, was born in Warren, R. I., and received a common-school education. He was an extensive traveller, and for many years published annual volumes under the title *Zig-Zag Journeys*, describing, in a literary form attractive to young people, the places which he visited. From 1871 to 1894 he was assistant editor of the *Youth's Companion.* He wrote, also, several volumes of verse, including *Poems for Christmas, Easter, and New Year* (1883) and *Songs of History* (1887), and many short stories embodying the romance and legend of New England.

Butt Joint, a joint (usually between iron plates) in which the two plates are brought to 'abut' together, and are then fastened together by cover-plates.

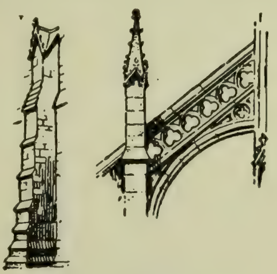
Buttons, devices of various shapes and sizes used either as a means of fastening together parts of garments or for purely ornamental purposes. Buttons as ornaments were common in ancient Egypt, and in China the button has long been the distinguishing badge of various castes and groups. In modern times, also, buttons have been used freely as society emblems, as well as for ornament and utility.

Originally buttons were the pure product of craftmanship and so remained until modern times, but at present they are objects of mass factory production. Among the substances from which modern buttons are made are metals, celluloid, ebonite, shell, pearl, bone, glass, papier-maché, wood, jet, precious stones, vegetable ivory and porcelain. Metal buttons without shanks are made by stamping. Those to which metal shanks are fitted have the disks punched and trimmed, and then soldered to the wire shank. Cast buttons are made by pouring molten metal into a mould, the loop of wire which forms the shank being suspended in it. For covered buttons two thin sheet-iron stampings are used—one a circular disk, and the other a smaller black piece, or collet, with a hole in the centre and several sharp points at right angles on the edge. The stuffing, overlaid with strong cloth, is placed on the disk, which is laid on the covering, the latter being gathered up over the materials. The collet is then forced down, the hooks holding it in position, while the stuffing forces the coarse cloth through the hole to form the shank, through which the needle is passed laterally. Shirt buttons are made of powdered steatite saturated with soluble glass; the mixture is forced into moulds, and is then baked and polished. Many other materials are moulded in a similar way. Buttons made from ivory, wood, and bone are turned on a button lathe. Mother-of-pearl buttons are cut out of shell by the tubular saw, split, and polished on the lathe.

Birmingham, England, is one of the centres of the button industry; pearl, metal, and linen buttons being produced there in large quantities. France is also a large producer; porcelain buttons, which at one time had a great vogue, being made in Briare and Montereau. Paris and Lyons also have large button industries. In the United States the manufacture of buttons dates from the beginning of the nineteenth century. Waterbury, Conn., is one of the chief centres of the metal button industry, and Muscatine, Iowa, of the pearl button industry. Covered buttons were first manufactured in 1827, and vegetable ivory buttons, made from the seed of a South American fruit, *Phytelephas macrocarpa*, first appeared in 1859. Consult Jones' *The Button Industry* (1924).

Buttonwood. See SYCAMORE.

But'tress, an abutment built outside a wall to relieve the latter of the outward thrust or pressure consequent on the weight of vault or arch. It has many forms, from that of a rectangular pier let into the wall, and usually extending outwards in terraces as it descends to the ground, to that of a free, arch-like structure, or 'flying buttress,' taking the pressure from the wall to solid foundations at a distance from the latter. The pinnacle was introduced to give weight to the buttress.



Buttress and Flying Buttress

Butuan, bo͞o-to͞o′än, pueblo, Mindanao, Philippine Islands, in Agusan province, on the Agusan River at the head of its delta; 101 miles south of Surigao. Gold is mined in the vicinity, and live stock, poultry, rice, and sago are produced. A monument has been erected here to Magellan, who landed on the site and celebrated his first mass in the Philippines. Pop. (1918) 9,136.

Buturlinovka, bo͞o-to͞or-lē-nōf′-kä, or PETROVSKOI, town, Russia, in Voronej government, on an affluent of the Don; 85 miles southeast of Voronej. Industries include milling and tanning establishments. Pop. 38,000.

Butyl Alcohol, bū′til, or BUTANOL, is known in four isomeric varieties, two of which are finding wide use as solvents. Normal butyl alcohol, $CH_3CH_2CH_2CH_2OH$ (B.P. 117° C.), is obtained in immense quantities, along with acetone and ethyl alcohol, by the fermentation of solutions of corn starch by *Clostridium acetobutylicum.* It is used in large quantities as a solvent for nitrocellulose in lacquers and for the preparation of butyl acetate. Its cheapness (by fermentation) and high solvent power are largely responsible for the rapid expansion of the nitrocellulose lacquer industry. Tertiary butyl alcohol, $(CH_3)_3COH$ (B.P. 83° C.), is made commercially from the gases obtained in cracking petroleum, and finds some use as a solvent. The other two varieties, iso-butyl, $(CH_3)_2CHCH_2OH$ (B.P. 107° C.), and secondary butyl, $C_2H_5CH_3CHOH$ (B.P. 102° C.), are unimportant commercially.

Butyl Chloral, $CH_3CHClCCl_2CHO$, is prepared by passing chlorine through acetaldehyde. It is an oily liquid that unites with water to form a hydrate. The latter is of similar anæsthetic and soporific properties to chloral hydrate, but has a specific action in relieving tic douloureux.

Butyric Acid, bū-tir′ik, $CH_3CH_2CH_2COOH$, is a fatty acid occurring in butter fat and in several vegetable fats and oils. It may be prepared by the fermentation of sugar or starch, mixed with water, skimmed milk, and putrid cheese, from which the specific bacillus that causes the action is derived. It may also be prepared by the oxidation of normal butyl alcohol. It is a thick, colorless liquid, with a sour taste, and the odor of rancid butter. It is soluble in water, and gives rise to a series of salts and esters, the butyrates.

Butyric Ether, or ESTER, a general name for compounds formed from butyric acid by the substitution of an alkyl group for the hydrogen atom of the carboxyl group. Ethyl butyrate is commercially prepared by heating butyric acid, sulphuric acid, and alcohol, and is used by confectioners, as it has a strong pineapple odor.

Butyrite, or Butyrellite. See Bog Butter.

Butzer, Martin. See Bucer.

Buxar. See Baxar.

Bux′ton, market town and watering place, England, in Derbyshire, on the Wye; 22 miles southeast of Manchester. It has long been celebrated for its natural hot mineral springs and its fine bracing climate. The town is surrounded on three sides by lofty green hills and comprises two sections, the old town and the new town, the former occupying a hill some 70 feet above the latter. The chief features of interest are the Crescent, which contains the natural or tepid baths at one end and the hot baths at the other; the Town Hall; Museum; Pavilion; concert hall; Devonshire Hospital, originally a riding school; and the beautiful gardens. Coal-mining, lime-working, and the manufacture of marble and spar ornaments are the leading industries. Pop. (1921) 15,651.

Bux′ton, Sydney Charles, First Earl Buxton (1853–), English politician and author, was educated in Clifton and at Trinity College, Cambridge. He served on the London School Board (1876–82), was member of Parliament for Peterborough (1883–5) and for the Poplar division of the Tower Hamlets (1886–1914), Under-secretary for the Colonies (1892–5), Postmaster General, with a seat in the Cabinet (1905–10), President of the Board of Trade (1910–14), and High Commissioner and Governor-General of South Africa (1914–20). He introduced penny postage to the United States and the Canadian Magazine post, and was responsible for the Copyright Act of 1911, for Part ii. of the Unemployment Insurance Act of the same year, for the Pilotage Act of 1912, and for the Bankruptcy Act, and Extension of Trade Boards Act of 1913. He was created a Viscount (of Newtimber) in 1914, and an Earl in 1920. His publications include: *Handbook to Political Questions; Political Manual; Finance and Politics: an Historical Study 1783–1885; Handbook to the Death Duties; Mr. Gladstone as Chancellor of the Exchequer; The Fiscal Question; Fishing and Shooting.*

Buxtorf, bo͞oks′tôrf, Johann (1564–1629), German Hebrew scholar, was born in Kamen, Westphalia. After completing his education in Heidelberg, Bâle, Geneva, and other cities, he travelled in Germany and Switzerland and in 1590 was appointed professor of Hebrew at Bâle. His earliest book was a manual of Biblical Hebrew, containing a grammar and a vocabulary (1602); then appeared a work on the Jewish synagogue (1603), a lexicon of Rabbinical Hebrew (1613), and an important work on the abbreviations employed in this form of the language. The greatest of his works published during his lifetime was the folio Hebrew Bible, together with the Targum, and the commentaries of the rabbinical writers, Ben Ezra and Rashi (1618), to which was afterwards added (1620) *Tiberias, sive Commentarius Masoreticus*, giving an account of the Scripture text according to the Jewish tradition. Buxtorf's sudden death of plague left unfinished two important works, afterwards completed and published by his son and successor (see below)—a Concordance to the Hebrew Bible (folio, 1632), and a Chaldaic, Talmudic, and Rabbinic Lexicon (1639; new ed. 1866–74). Consult Diestel's *Geschichte des alten Testaments in der Christlichen Kirche;* Kautzsch's *J. Buxtorf der Altere.*

Buxtorf, Johann, The Younger (1599–1664), German Orientalist, was born in Bâle and succeeded his father as professor of Hebrew in the University there (1629). He engaged in a violent controversy with L. Cappel, claiming divine authority for the entire Masoretic text, vowels as well as consonants. These views were set forth in several treatises—*De Litterarum Hebraicarum Genuina Antiquitate* (1643), *Tractatus de Punctorum Origine* (1648), *Anticritica* (1653), and *Latin Dissertations* (1664). He also edited and extended his father's writings, notably *Lexicon Chaldaicum, Talmudicum, et Rabbinicum* (1639) and *Concordantiæ Bibliorum Hebraicorum* (1632). In 1629 he edited Maimonides' *More Nevochim.*

Buxus. See Box.

Buys-Ballot, bois-bä-lō′, Christoph Heinrich Diedrich (1817–90), Dutch meteorologist and mathematician, was born in Kloetinge in Zeeland. He was educated in Utrecht University, where he became professor of mathematics in 1847, and of experimental physics in 1870. From 1854 he was director of the Royal Meteorological Institute, and in this capacity he was one of the pioneers of the present system of weather forecasting by means of collating observations at numerous reporting stations. He discovered the law relating to atmospheric depressions known by his name and was the inventor of the aeroklinoscope (q.v.).

Buzeu, bo͞o′ze-o͞o, or Buzau, town and episcopal see, Roumania, on the Buzeu River; 60 miles east of Braila. It has trade in grain, hides, and petroleum. It was the scene of desperate fighting in the Great War and was occupied by German forces in December 1916. Pop. (1914) 29,483.

Buzuluk, bo͞o-zo͞o-lo͝ok′, town, Russia, in Samara government; 107 miles east of Samara. There are tanneries and copper foundries and trade in horses, cattle, and cereals. Pop. 15,000.

Buzzard, a name applied to twenty or more species of birds of prey, widely distributed over the globe, constituting the subfamily Buteoninæ. They have short, rounded heads, strongly curved beaks, long, square tails, and a slow and rather heavy flight. They live chiefly upon small mammals, although they also eat reptiles, young birds, and insects. The Common European Buzzard (*B. vulgaris*), found practically everywhere in Europe, is about 22 inches long, and dark brown in color, with the under parts generally a yellowish white. Its prototype in America is Swainson's Buzzard (*B. obsoletus*), found in most parts of the country. Closely allied to the Buteoninæ are the Rough-legged Buzzards, the best known of which is *Archibuteo lagopus*, a European bird somewhat larger than the common buzzard and having the metatarsus feathered to the toes. The so-called Turkey Buzzard is not a buzzard, but a vulture (q.v.).

Buzzards Bay, an arm of the Atlantic Ocean indenting the southern coast of Massachusetts, dividing Barnstable county on Cape Cod from the mainland. It is about 30 miles long and has an average width of 7 miles. The Elizabeth Islands, which enclose it on the southwest, form one side of Vineyard Sound.

By, John (1781–1836), English engineer, served in the Peninsular War, and in 1826 went to Canada, where he constructed the Rideau Canal, connecting the Ottawa River with Lake Ontario—a work which cost about $5,000,000. By-town, named after him, was later called Ottawa.

Byblos, bib′los, a city of great antiquity on the Phœnician coast, between Berytus and Tripolis; it was the chief seat of the worship of Adonis. See Jebail.

Byes′ville, village, Ohio, Guernsey county, on the Pennsylvania Railroad; 95 miles east of Columbus. Coal mining and the manufacture of glass, engines, and brick are the chief industries. Pop. (1910) 3,156; (1920) 2,775.

Byker, bī′kėr, ecclesiastical parish, Northumberland, England. It has manufactures of chemicals, lead, glass, and pottery. Pop. 70,650.

By-law, a local regulation or enactment made by a subordinate legislative authority. Of

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GENERAL JULIAN HEDWORTH BYNG, FIRST BARON BYNG OF VIMY, APPOINTED GOVERNOR-GENERAL OF CANADA, 1921.

this character are the laws and ordinances of minor municipal corporations, such as cities, counties, towns, villages, and the like, as well as the rules adopted by certain corporations, such as railway companies, under the authority of the State, to regulate their affairs and their relations with the public. All such regulations, whether of municipal or private corporations, have the force of law in so far as they are enacted under proper legal authority.

The by-laws of clubs and other voluntary associations are in the nature of 'gentlemen's agreements' for the regulation of their intercourse with one another, and are not usually enforceable at law. The term is usually applied to the minor regulations of an association or society, its forms of government, organization, etc., being comprised in a 'constitution,' to which the by-laws must conform. See CLUBS, LAW RELATING TO.

Bylazora. See KOPRULU.

Byles, MATHER (1706-88), a native of Boston, Mass., was graduated from Harvard, became pastor of the Hollis Street Congregational Church, Boston, and speedily acquired a pulpit reputation. During the Revolution he supported the British, and as a consequence his church was dissolved. Subsequently he was arrested and tried and imprisoned in his own house. He published many sermons and several poems. His son Mather Byles (1736-1814) was also a Congregational clergyman, but later entered the Established Church and with other Tory sympathizers emigrated to St. John, New Brunswick.

Bylini, bi-lē'nē, a name given to the heroic ballads of Russian popular poetry. They are divided into several cycles, as those dealing with the legendary heroes; the cycle of Kiev, the chief heroes of which are Vladimir and the peasant Ilya Muromez, or Ilya from Murom—this is the principal cycle; the cycles of Novgorod, of Moscow, of Peter the Great, etc. The principal collections of *bylini* were made by Ribnikoff, by Kireievski, and by Sobolevsky. Avenarius has published an anthology of *bylini*. Consult Rambaud's *La Russie Epique;* Ralston's *Russian Folk-Tales* and *Songs of the Russian People.*

Byng, bing, GEORGE. See TORRINGTON, VISCOUNT.

Byng, JOHN (1704-57), English vice-admiral, a son of Admiral George Byng. In 1756 he fought the unsatisfactory action off Minorca, and being convicted subsequently by court-martial of not having done his best, was sentenced to be shot. He was accordingly executed on board the *Monarch,* at Portsmouth, on March 14, 1757. He suffered for too strict observance of forms, rules of discipline, and points of naval etiquette, the weakness of which was shown by his defeat. There was no imputation upon his honor or his courage.

Byng, JULIAN HEDWORTH GEORGE, FIRST BARON BYNG OF VIMY (1862-), British army officer and governor-general of Canada, seventh son of the second earl of Strafford, entered the army in 1883 as a member of the 10th Royal Hussars; was promoted to the rank of major in 1898, to colonel in 1901, to major-general in 1909, to lieutenant-general in 1916, and to general in 1917. He served in the Sudan expedition in 1884 and in South Africa in 1899-1902; and was in command successively of the 10th Royal Hussars (1902-04), the Cavalry School at Netheravon, Salisbury Plain (1904-05), the Second Cavalry Brigade (1905-07), and the First Cavalry Brigade (1907-09). From 1910 to 1912 he commanded the East Anglian Division, and in 1912-14 led the British army in Egypt.

At the beginning of the Great War (1914-19) General Byng was with the British Expeditionary forces that fought at Antwerp, commanding the Third Cavalry Division that forced the Germans to retreat at Ypres, and in 1915 he succeeded General Stopford in command of the Ninth Army Corps at Sulva Bay, and was active in the Gallipoli campaign. He commanded the Canadian corps at the Battle of the Somme (1916), and in the capture of Vimy Ridge (April 9, 1917), led the Cambrai offensive of November, 1917, and was in command of the Third British Army. For his distinguished services in the Great War he received the Belgian Croix de Guerre, the Grand Cross of St. Vladimir from Russia, the Grand Legion of Honour from France, the White Eagle from Serbia, the French Croix de Guerre, and the Distinguished Service Order from the United States, and was thanked by Parliament and given £30,000 for meritorious service. In 1921 he was appointed Governor-General of Canada, the inauguration ceremonies taking place on August 11.

By-Products, substances or results obtained in the operation of a specific process, in addition to the substance or result primarily sought. Thus, in hunting game for food, the hides and the feathers are by-products; in hunting game for hides or pelts, the carcasses are by-products.

In the classification of the products of manufacture, three groups are recognized—*viz.: principal product,* which is that product of an establishment manufacturing more than a single product that has the largest total value; *subsidiary product,* having a less total value; and *by-product.* A subsidiary product may be a utilized by-product, or it may be the product of an allied industry—as, for instance, bookbinding in a printing office, or compounding fertilizers in a cottonseed-oil mill. This last example is one of many occurring in factories where the by-product of the principal industry—in this case cottonseed meal—becomes the raw material for the manufacture of a subsidiary product.

The development and growth of manufactories using manufactured products as the raw material for further manufacture has not infrequently created such a change in the demand for the products of the primary establishment as to make one of its subsidiary products its primary product. A notable example of this is the Le Blanc process for the manufacture of soda products from common salt by the action upon it, in the first stage of manufacture, of sulphuric acid. In this operation, hydrochloric acid gas is given off as a by-product. At first this was allowed to escape into the atmosphere. To avoid the nuisance thus created, this gas was collected by dissolving it in water, and sold, thus becoming a subsidiary product; but with a greatly increased demand for this substance, and with the competition of electrolytic and other processes, through which the cost of the production of sodas was reduced, hydrochloric acid became in many cases the principal product of the Le Blanc factories.

The custom of utilizing by-products is a very ancient one in its origin, though in the newer countries, where raw material was abundant, and in the early development of industries, where the unit of production was small and competition was slight, by-products have generally been wasted, and frequently have become sources of nuisances. But with increasing density of population, through which the necessity for abating nuisances became urgent; with the increase in the unit of production; with a diminution in the quantity of raw material, or the ease with which it could be obtained, and with the increase in competition, additional attention has been given to the utilization of the by-products of manufacture, until to-day they have become of great importance in all industries.

Naturally, the by-products that were first to be utilized were those which were most readily observed and whose uses were most obvious. The by-products which ran off in solution or passed away as gases, or forms of energy, such as heat, or those whose uses were remote or less readily apparent, have until very recent times been allowed to go to waste. The discovery of the first of the aniline coloring matters, mauve, in 1856, by the English chemist William Henry Perkin, and the fact that the aniline from which it is manufactured could be obtained in abundance from coal tar, gave an impetus to the utilization of the last enumerated by-product; and the rapid growth in commercial importance of the coal-tar products industry so concentrated attention on this phase of manufacture that the utilization of by-products has gone on with ever increasing expansion.

Some examples of industries, with their by-products, are the following:

Coke and Gas Industry.—Among the utilized by-products of the coke industry are gas, ammonia, and tar, all of which are wasted in coking coal in beehive ovens, but are recovered when by-product ovens are used. According to the U. S. Census of Manufactures for 1914, by-products of the coke industry were valued as follows: gas, $6,009,583; tar, $2,867,274; ammonium sulphate, $4,696,590; anhydrous ammonia, $2,300,137; ammonia liquor, $658,497; others, mainly benzol, $997,007. By-products of gas manufactures and their value (1919) were: coke, $17,822,900; tar, $4,661,300; ammonia liquor, $1,677,200; ammonium sulphate, $205,000; and hydrocarbons.

Iron and Steel.—The principal by-products of the blast furnace used in the iron and steel industry are gas and slag. Up to the last decade, the gases from blast furnaces were utilized to some extent in heating the 'stoves,' and burned to some extent under boilers, but much was wasted. They are now efficiently used in internal combustion engines for the production of power. Formerly, also, although some of the enormous quantity of slag running constantly from blast furnaces was used for minor purposes, as insulating material, paving blocks, road ballast, and roofing material, most of it went to the dump. It is now largely used in the manufacture of Portland cement. Slag from the basic processes of making steel is utilized abroad as a fertilizer under the name of Thomas slag or Belgian phosphate. Copperas is produced in the pickling of steel wire during the drawing process. Flue dust is utilized by briquetting and returning to the furnace.

Slaughtering and Meat Packing.—The utilized by-products include albumen, bristles, blood, bones, fertilizers and fertilizer material, gelatin, grease, glue, hair, hides, hoofs, horns, intestines, pancreatin, parotid substances, pepsin, skins, thymus, thyroids, and wool. (See PACKING INDUSTRY.)

Smelting of Sulphide Ores.—This process yields great quantities of smoke or fumes. The analysis of the smoke of one smelter in the United States, reported in 1907, showed an approximate daily output in the smoke sent into the atmosphere of 55,000 pounds of arsenic trioxide, 1,500 to 2,000 tons of sulphur dioxide, 150 tons of sulphur trioxide, 6,000 pounds of zinc, 5,000 pounds of copper, 6,000 pounds of lead, and 5,000 pounds of antimony. Various establishments are now collecting and utilizing these by-products, the sulphur oxides being converted into sulphuric acid by the contact process.

Wood Distillation is an example of an industry created by the utilization of by-products. When charcoal is produced by charring wood in mounds or meilers, the smoke is wasted by passing off into the atmosphere. When the wood is charred in kilns, ovens, or retorts, and the smoke is condensed and collected, there is obtained acetic acid, or acetate of lime, and wood alcohol, the charcoal together with gas and tar being by-products. According to the Census of Manufactures for 1919, there were thus produced in the United States 152,064,000 pounds of acetate of lime, having a value of $2,682,200; 6,981,000 gallons of crude wood alcohol, having a value of $5,593,500; 48,499,000 bushels of charcoal, valued at $8,231,400; 1,521,000 gallons of turpentine, valued at $1,207,200; 234,000 barrels of rosin, valued at $2,742,600.

Cyanide Industry.—The simple and complex cyanides were originally, and to an extent are to-day, primarily produced by fusing together scrap leather, hoofs, or horns, which are by-products of the leather and slaughtering industries, with scrap iron, which is the by-product of a multitude of household and commercial industries, and potassium carbonate, recovered by lixiviation from the ash of wood, which is a by-product from the burning of wood as a source of heat energy. By lixiviating the fusion product, potassium ferrocyanide, commonly known as yellow prussiate of potash, is obtained; and from this, potassium cyanide and the multitude of simple and complex cyanides are made. To-day, primary cyanide material is also obtained from spent purifying material of gas works, from blast furnaces, and, by the use of calcium carbide, from the nitrogen of the atmosphere.

Explosives and Coal-Tar Color Industries.—In these industries mixtures of nitric and sulphuric acids, known as 'mixed acid,' are used to convert alcohols, such as glycerine, cellulose, starch, and the like, into esters, such as the so-called nitroglycerine, guncotton, and nitrostarch, or hydrocarbons and phenols, such as benzene, toluene, and 'carbolic acid,' into nitro-compounds, such as nitrobenzenes, nitrotoluenes, and nitrophenols—picric acid being the best known example of the latter compounds. There are produced as by-products nitrogen oxides, which are evolved as orange-red fumes, and spent acid which is a mixture of diluted sulphuric acid with some unused nitric acid fouled by other products of the operation. The nitrogen oxides are recovered by means of a solution of sodium hydroxide, whereby sodium nitrite is formed, and this product is largely used in the diazotization processes by which the nitro-compounds are converted into more advanced derivatives of benzene. The nitric acid is recovered from the spent acid and converted into ammonium nitrate, which is largely used in compounding explosives, while the sulphuric acid is regained, concentrated, and again used in nitration.

Natural Gas.—In pumping natural gas from wells, through compression and expansion, with cooling, various petroleum hydrocarbons of the 'naphtha and gasoline' class are obtained as by-products. In recent years the industry built up on the recovery and utilization of these by-products had reached valuable commercial proportions when it was practically destroyed by a ruling of the Bureau of Explosives of the American Railway Association, which condemned the product as dangerous, and thereby prohibited its transportation by rail. In 1911 Dr. W. O. Snelling devised a method for dividing the original products into fractions, each of which is safe for transportation. One of these fractions is of particular interest as it is a liquefied gas which can be used as an illuminant in the same manner as the Pintsch and Blau gases, now in extensive use.

Petroleum Refining.—Originally the product sought in this industry was kerosene, all of the residue of the substance going to form by-products, much of which was wasted. To-day several score of subsidiary products are obtained in this process. They may be summed up as burning oils, coke, naphtha and gasoline, neutral filtered oils, paraffin oils, paraffin wax, reduced oils, residuum, and vaseline. In 1925 light products of distillation including gasoline, benzine and naphtha, totalled 11,311,044,622 gallons, valued at $1,268,647,929; illuminating oils totalled 2,365,301,739 gallons, valued at $161,880,676; lubricating oils, 1,361,071,547 gallons, valued at $252,104,578; fuel oils, 14,604,037,579 gallons, valued at $488,957,806. In 1925, 739,489,345 barrels of crude oil and 1,165,824 short tons of sulphuric acid were consumed in refining.

General.—In *brewing*, the malt, after extraction, serves as food for cattle, the excess of yeast is available for baking, and the carbon dioxide set free in the fermentation can be collected and compressed for the manufacture of aerated waters, to force beer through service pipes, and similar purposes. In *distilling*, the disposal of the 'burnt ale' is a serious question. If run into streams it produces an objectionable pollution, while other methods of getting rid of it are costly and not thoroughly effective. Decomposition by bacteria has had but little success; the most hopeful method of disposal is by some process of evaporation, the product being used for manure. *Soap and candle works* produce considerable quantities of glycerin and salt as by-products; *wool-scouring* yields wool grease, employed in the manufacture of lanoline, soaps, and lubricants; the *pressing of seeds for oil* yields a 'cake' valuable for cattle food; the *fermentation of wine* is the source of tartaric acid; while the residues of the *beet-sugar industry* produce alcohol, potassium compounds, methyl chloride, and the like.

See Brewing; Candle; Distillation; Dyeing; Sodium; Sulphuric Acid; Tar; Coal Tar; Slag; Soap; Sugar; Wool.

Byrd, bĕrd, Richard Evelyn (1888–), American aviator and explorer, was born in Winchester, Va. He was educated at the Virginia Military Academy, the University of Virginia and the United States Naval Academy, being graduated from the latter in 1912. After four years' sea service he took up the study of aviation and during the World War commanded the United States naval air forces in Canadian waters and built up the naval aviation stations at North Sidney and Halifax, N. S. In 1925 he accompanied the MacMillan Expedition to Greenland under the auspices of the National Geographic Society and acting as flight commander flew more than 3,000 miles. In May, 1926, with his pilot, Floyd Bennett, he flew from Spitzbergen to the North Pole, circled it several times and returned to his starting point, covering 1,600 miles in 15½ hours. In June 1927, Commander Byrd flew to France with three companions. The weather was very bad and although they reached Paris they were unable to land on account of thick fog, but landed in Ver-sur-mer after a period of 43 hours and 20 minutes. Commander Byrd is not only a skilful and daring aviator, but also a scientist of high repute whose observations taken during his flights are most valuable.

Byrd (Bird, or Birde), William (?1538–1623), English musical composer, was 'bred up to musick under Thomas Tallis.' He was organist of Lincoln Cathedral in 1563, and in 1569 succeeded to a vacant post in the Chapel Royal, London. He published a quantity of sacred music, including three masses; was an indefatigable composer of music for the virginals (*e.g.*, *Parthenia*, about 1608, in conjunction with Bull and Orlando Gibbons); and in 1588 contributed the first English madrigals to a collection entitled *Musica Transalpina* (1588).

Byrgius, bûr′ji-us, or Bürgi, Justus or Joost (1552–1633), Swiss mathematician, was born in Lichtensteig, Canton St. Gall. He was for many years in the service of William iv., Landgrave of Hesse, for whom he constructed globes and a large number of astronomical instruments, and in 1603 entered that of the Emperor Rudolf ii.

Byrlaw, bir′lô, the ancient code of laws by which rural communities were governed in minor affairs, such as the valuation of stock, the allocation of common land, or the limitation of boundaries. They were administered by local tribunals, whose jurisdiction and procedure were of customary origin. This system prevailed in Great Britain until the end of the eighteenth century, and is not yet absolutely extinct in Scotland. See By-law.

Byrnie, bûr′ni (Norse, *brynja*), the ringed coat of mail worn by the ancient Scandinavian warriors.

By′ron, George Gordon Noel, Lord (1788–1824), one of the great poets and literary forces of the nineteenth century, was born in Holles Street, London. His father, Captain John Byron, nephew of the fifth or 'wicked' Lord Byron, having squandered his wife's fortune, died in Valenciennes in 1791, and Mrs. Byron settled in Aberdeen. In the year 1798 Byron succeeded to his granduncle's title and estates, and he and his mother settled at the family seat of the Byrons, Newstead Abbey, Nottinghamshire. Two years were now spent in a school at Dulwich, and then he went (1801) to Harrow—his experiences at that famous school forming the subject, in later years, of his *Childish Recollections.* The year 1803 is marked by his passion for Mary Anne Chaworth of Annesley, a girl two years his senior. In 1805 Byron entered Trinity College, Cambridge, where he caused considerable anxiety to his friends and the authorities by his irregularities.

During this period his poetic impulses had begun to find expression, and in 1807 he published his *Hours of Idleness.* It was severely criticised by Brougham in the *Edinburgh Review*, and Byron retorted in 1809 with his satirical *English Bards and Scotch Reviewers.* On coming of age Byron went abroad, and spent two years in making a tour through Spain, Albania, Greece, Turkey, and Asia Minor. After publishing *The Curse of Minerva*—a poem now only valuable from its rarity—in 1812 he issued the first two cantos of *Childe Harold.* The success of this splendid poem was immediate. *The Giaour* and *The Bride of Abydos* both appeared in 1813, and in 1814 the fine ode to *Napoleon Buonaparte*, *The Corsair*, and *Lara.* The *Hebrew Melodies*, published in 1815, were written for a selection of melodies arranged by Braham and Nathan.

Lord Byron

In 1815, he married Anne Isabella Milbanke, daughter of a wealthy Durham baronet. In January, 1816, she left him and with her daughter, Ada, returned to her parents. The true cause of this separation has never been ascertained, but it was final. Byron then went abroad, and settled for a time in Switzerland, where he wrote the third canto of *Childe Harold*, *The Prisoner of Chillon*, *The Siege of Corinth*, *Parisina*, the *Dream*, and part of *Manfred*. While in Switzerland Byron met the Shelleys, and formed a friendship with the poet, and contracted an illicit alliance with Claire Clairmont, a connection of the second Mrs. Shelley. From Switzerland he passed on to Venice, where in 1819 he became acquainted with the Countess Guiccioli, in whose society in the following three years he spent most of his time, living successively in Ravenna, Pisa, and Genoa.

In 1817 he finished *Manfred* and in the same year produced *The Lament of Tasso*, *Darkness*, and the *Monody on Sheridan*. *Beppo* appeared in 1818, and *Mazeppa* in 1819. The publication of *Don Juan* began in 1819, and continued for five years. To the year 1821 belong the *Letters* to Murray on Bowles' strictures on Pope, *Marino Faliero*, *The Prophecy of Dante*, *Sardanapalus*, *The Two Foscari*, and *Cain*. To the *Liberal*, a Radical periodical conducted for a brief period by Leigh Hunt, Byron, and Shelley, Byron contributed *The Vision of Judgment* (1823), a poetical parody upon a poem of that name by Southey. In 1823, *Heaven and Earth*, a dramatic poem by Byron founded on a passage in Genesis, also appeared in that periodical and *Werner* was published in 1822, the year in which Lord Byron fulfilled the melancholy duty of witnessing the cremation of Shelley's body. *The Island*, a poem suggested by some of the incidents in the mutiny of the *Bounty; The Age of Bronze*, a satire in heroic verse; and the first canto of the *Morgante Maggiore di Messer Luigi Palei*, a translation, were published in 1823 and *The Deformed Transformed*, the last work by the poet, appeared in 1824.

Resolved to aid the Greeks in their struggle for independence, Byron sailed from Genoa, and on Jan. 4, 1824, arrived at Missolonghi. His physical powers proved unequal to the strain, and after three months of strenuous effort he died of rheumatic fever. His body was taken to England, and interred in the church of Hucknall-Torkard, near Newstead.

The keynote of Byron's character was an extraordinary and egotistical sensitiveness, which was a contributory cause of many of his troubles, and everywhere finds expression in his verse. He was capable of great generosity and high feeling, misanthrope and cynic though he was in some of his moods. 'The great poetic heart' asserts itself again and again, even in such a poem as *Don Juan*. And although he chose to simulate the rake and libertine, yet he has written several passages which are the outcome of deep spiritual feeling. Byron's name and works exercised a wonderful fascination over his foreign contemporaries, and almost the whole of European literature was for a time under the influence of his inspiration.

The best edition of his works is that published in 1898–1901—the *Poetry* (5 vols.), edited by Ernest Hartley Coleridge; and the *Letters and Journals* (6 vols.), by Rowland E. Prothero. W. E. Henley's edition (1897) and the Cambridge edition of the *Poems* (1905) are also deserving of notice. His *Life* has been written by the poet Moore (1832–3); Elze (Eng. trans. 1872); Nichol (1880); Noel (1890); Ackermann (1901). Consult also memoirs and biographical works by Medwin, Leigh Hunt, Lady Blessington, Trelawney, Countess Guiccioli; Edgecumbe's *Byron, the Last Phase*. For criticism, consult Matthew Arnold's *Essays in Criticism;* Dowden's *Studies in Literature;* Jefferson's *Real Lord Byron;* Morley's *Literary Essays*.

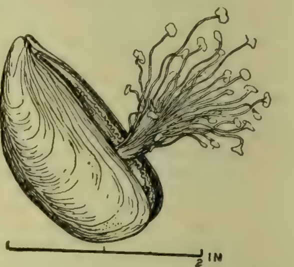
Byron, Henry James (1834–84), English dramatist and actor, was born in Manchester. He is the author of nearly 150 pieces (comprising comedies, farces, burlesques, and pantomimes) produced in London between 1858 and 1882. His most popular play was *Our Boys*, which ran for more than four years at the Vaudeville Theatre (January, 1875, to April, 1879). His best piece of work, however, was probably *Cyril's Success* (Globe Theatre, 1868). He also wrote a play called *An American Lady*. His farces and comedies were characterized by a ready and homely humor, and in his extravaganzas he displayed great ingenuity in punning. He acted occasionally in his own plays, between 1868 and 1878, and at various times ventured upon theatrical management, usually with disastrous results. He was the first editor of *Fun*, and in 1865 published a novel entitled *Paid in Full*.

Byron, John (1723–86), English vice admiral, was second son of the fourth Lord Byron, and grandfather of the poet. He accompanied Anson in his voyage round the world (1740–4). In 1761 he was given command of a small force which was dispatched on a new voyage of discovery. In the *Dolphin* (1764–6) he visited Madeira, Brazil, Patagonia, the Falkland Islands (of which he took possession), the Pacific, including the Society Islands, the Ladrones, Batavia, and the Cape, and reanchored in the Downs in May, 1766. In 1769 he was appointed governor of Newfoundland, and ten years later he was in command of a squadron in the West Indies, whither D'Estaing had gone, while assisting the Americans in the Revolutionary War. In July, 1779, he fought an action with D'Estaing off Grenada, in which Byron was defeated. His views concerning the duties of the navy in connection with maritime exploration led to the voyages of Captain Cook.

Byron Bay, a wide bay on the eastern coast of Labrador, lat. 54° 40′ N. and long. 58° W.

Bysmalith, biz′mā-lith, an intrusion of igneous rock reaching toward the surface as a kind of massive plug through the overlying beds. The rock may be of any type, the form and origin being the essential features.

Byssus, bis′us ('flax'), the silky threads by means of which many bivalves attach themselves to a firm surface. The byssus threads are secreted in a gland in the foot which is the homologue of the mucous gland of the snail, and can be speedily renewed if severed. They are seen in very simple form in the common edible mussel (*Mytilus*), which is always attached to its surroundings by a tuft of golden threads. In Lima the threads are used to fasten together stones, shells, and calcareous weed to form a nest, within which the animal lives. In some bivalves—*e.g.*, the freshwater mussel (*Anodon*)—the byssus is present only in the young; in others it is always absent, while in some species the old byssus may be abandoned and a new one formed. In the south of Italy and in Sicily byssus threads are woven, mixed with silk, into gloves, or stockings. The name is also applied to an extraordinarily fine, transparent textile, woven in antiquity out of a delicate linen thread grown in Egypt and Syria. Hence there were two chief varieties, Alexandrine and Syrian, the latter woven at and near Antioch, and used as a head covering.



Byssus of Common Mussel

Byström, bü′strûm, Johan Niklas (1783–1848), Swedish sculptor, was born in Filipstad. He studied under Sergell at Rome, whence he returned in 1816 with an almost complete portrait-statue of *Bernadotte*, the Crown Prince, as Mars. Among others, he executed the colossal statues of *Charles X.*, *Charles XI.*, *Charles XII.*, and *Gustavus Adolphus;* the altar decorations *Christ with Faith, Hope, and Charity* in Linköping Cathedral, and the sitting *Linnæus* at Upsala. He succeeded best, however, with the figures of women and children—*e.g.* his *Juno with Little Hercules.*

Bytown. See OTTAWA.

Byzantine Empire. The formal foundation of the Eastern, or East Roman, or Byzantine empire took place in 395 A.D., when Theodosius the Great, at his death, permanently divided the empire between his sons Arcadius and Honorius. To the share of Arcadius fell the Asiatic portions, together with Egypt, Thrace, Mœsia, Macedonia, and Greece.

From 488 onward the Slavs became the molesters of the empire on its Danube frontier; but the emperors who succeeded Arcadius had rectified the mistake of Theodosius, and reorganized the army, making the native element more prominent. The consequence was that, while the Eastern was as much exposed as the Western empire to the barbarians, the Eastern empire was preserved intact, while the Western was broken up. Arcadius had been nominally succeeded by Theodosius (408–450), but really by Pulcheria, a sister of the young emperor, by whose advice Theodosius was content to be guided, and whom he designated as his successor. The three emperors who succeeded Pulcheria and her husband Marcianus (450–457), Leo (457–474), Zeno (474–491), and Anastasius (491–518), carried the Eastern empire safely through the storms which proved fatal to the empire of the West.

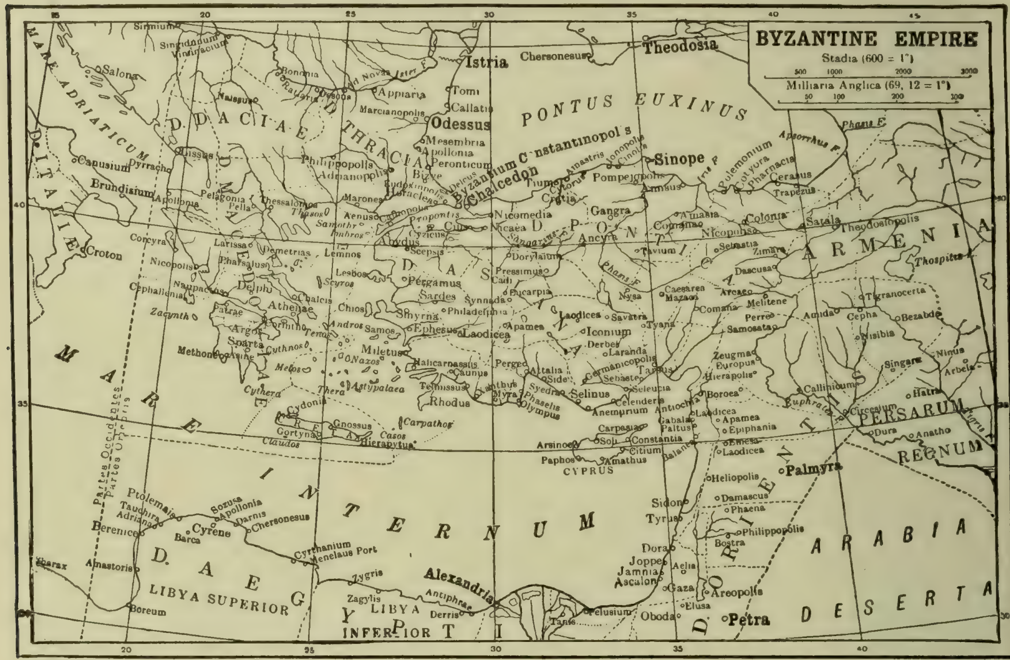
On the death of Anastasius the sceptre passed to Justinus, and in 527 to his nephew Justinian, who reigned for thirty-eight years, and dominated his century. Justinian received an intact and, on the whole, prosperous realm, which had not suffered from serious attack for forty years in its European provinces, while the Asiatic provinces had been free from invasion for a much longer period. Slavs and Bulgarians had crossed the Danube, but they made a very slight impression and did not remain. There had been insurrections in Asia Minor, but they were repressed and left but small trace of disturbance. But in spite of the brilliance of his reign, the empire was in a depressed condition when he died, in 565. This was due partly to the oppressive financial measures which his foreign policy rendered necessary, and partly to the terrible ravages of the plague in 542. Personally he is most celebrated as a legislator for his codification of the laws; he is also notable as the supporter, though not the originator, of Byzantine architecture; but his foreign policy renders him not less noteworthy. His wife, Theodora, who had been an actress, and whom he married against the wishes of his uncle, Justinus, proved to be a capable helpmate and adviser. Justinian's domestic life was without reproach, and in his strict attention to the business of government he was a shining example to idle and dissolute successors. That his financial measures were so oppressive and weakening to the empire was due less to his conscious permission than to his ignorance of the elementary principles of equitable taxation, as well as to an administrative system under which it was impossible to apply them, and of which monopolies, tax farming by middlemen, and arbitrary dues seemed an inseparable part. After a five-years' indecisive war with Persia (which is notable chiefly because it revealed the generalship of the great Belisarius, who assisted also in the suppression of the Blue and Green factions in the capital, which, by the 'Sedition of Nika,' in 532, nearly drove Justinian from Constantinople), it was possible to direct the forces of the empire, under Belisarius and Narses, to the reconquest of the Western empire from its German invaders. As a result, Africa and Italy and a considerable portion of Spain were added to the Eastern empire. The attention of Justinian's successors, Justinus II. (565–578), Tiberius (578–582), and Maurice (582–602), all of them able administrators, was taken up with meeting the Slavic invasions; but in spite of their ability, the empire was steadily going downhill. Maurice was not able to make headway against the barbarians; and owing to his harsh and niggardly treatment of his army, a rebellion broke out against him, which resulted in his murder in 602.

Phocas, who was then raised by the army to the imperial throne, proved much more incapable than Maurice, and was deserted by his own troops, and Heraclius, in 610, took over the empire, then almost in the throes of dissolution. For twelve years Heraclius strove to reorganize the army and the finances of the empire, without much apparent success. Against the Persians he could not hold his own, till the blasphemous insolence of the Persian king, after his capture of Jerusalem, roused the empire to a holy war, and the churches supplied not only enthusiasm, but money, while Heraclius was able to stop the expenditure on corn for the doles to the citizens of Constantinople—an expenditure which, from 616, when Egypt was lost, had paralyzed the treasury. After a prolonged struggle with the barbarian Avars on his northern boundary he was able in 622 to take the field against Persia; and in six campaigns, in which he showed such skill that Gibbon compares him to Hannibal, he crushed its power completely, and in 628 concluded a glorious peace, which restored the empire to its former boundaries and recovered the cross. But his victory did not secure him rest. The exhausting taxation under Justinian and his successors had paralyzed commerce and industry. Mainly through the former's example, despotism had become complete; laxity in morals among high and low accompanied the general impoverishment. Besides, the great Saracen invasion was at hand; indeed, at the very moment of Heraclius' triumph Mohammed sent out his famous letter inviting the kings of the earth to embrace Islam. The Saracens quickly overran Syria and Egypt; and in 641 Alexandria alone of Egyptian territory remained in Roman hands.

After the death (641) of Heraclius things went from bad to worse, although the empire received a valuable respite, after twenty-seven years' war, by the civil war among the Moslems due to the contest for the caliphate. This respite enabled Constans II. (642–668) to reorganize the administration of the empire on practically a war basis. But the energy of the empire was unprofitably consumed in theological controversies, which did not cease even in the face of renewed activity on the part of the Saracens. In 673 the now united Saracens launched a fleet and an army against the capital itself, and for four years strove in vain to capture it. But this success against the Moslem was short-lived, and for a quarter of a century anarchy prevailed, and the empire lost most of its provinces in Asia to the Saracens, and in Europe to the Bulgarians, and was only saved from complete destruction by the energy and ability of Leo the Isaurian, one of the generals in the East, who in 716 seized the throne. In 717 Constantinople had to endure another siege by the Saracens; but they were repulsed with heavy loss, and, so far as danger to Europe was concerned, their power was broken. Leo, and not Charles Martel, really saved Europe from the Saracens, for he drove back the main army of advance. For three hundred years longer there was war on the borders, but before Leo's death, in 741, Asia Minor was clear of Saracens.

The history of the 8th century is chiefly remarkable for the controversy regarding image worship. It was begun by Leo the Isaurian, whose severe edicts against the use of images in worship were supported by his submissive friends, but roused the fierce opposition of the bishops and monks. The policy of most of his successors until nearly the 9th century was similar. They quoted against the 'image worshippers' the arguments and reproaches of the Mohammedans. The bishops of the European provinces were profoundly alienated, and the controversy largely caused the separation of Italy from the Byzantine empire. Moreover, the emperors and their 'image-breaking' supporters were put out of sympathy with the priests and the populace of Constantinople. Meanwhile Crete and Sicily were lost to the Saracens, and the theological controversy was not brought to a close till the Council of Nice in 842 decided against the iconoclasts. So long as the Asiatic provinces supplied the emperors the controversy continued, and was not really ended till a European line, in the person of Basil the Macedonian (867–886), ascended the throne, and the European iconodules triumphed. The Macedonian dynasty which began with Basil continued, with some short interruptions, till 1056. It ruled over an empire which was now solely an empire of the East. Down to 800 the West had, through the popes, acknowledged nominal dependence on the East; but when, in 800, Pope Leo III. crowned Charlemagne as Roman emperor, the division of East and West was firmly and permanently completed. Still, between 395 and 800, East and West had been more nominally than really distinct and separate. Even when there were two emperors, the 'empire' was, theoretically at least, one and the same Roman empire founded by the Cæsars; but the crowning of Charlemagne made a Western empire, which was a rival of the Eastern Roman empire, whose name until that time had no real justification.

The eighty years which followed the death of Basil in 886 are the most uneventful in the history of the empire. The empire of the caliphs was breaking up, and the Bulgarians were converted to Christianity, and thereafter gave but little trouble; and the Emperors Leo VI. (886–912) and Constantine (912–959) being men of letters rather than men of action, and being left in peace, did not seek war by committing aggression on their neighbors. A period of military glory under the successful general Nicephorus Phocas, who became emperor in 963, but was murdered by John Zimisces, who succeeded him in 969, revived the memory of earlier days; but, except that the Russians made their first attempt on Constantinople in these reigns, nothing of decisive importance occurred. About the middle of the 11th century Isaac I. (1057–9) founded the Comnenian dynasty, which ruled to 1185. A new and more formidable enemy was gathering strength in the East while the dribble of incompetent emperors continued through the 11th century. The Seljuk Turks had made themselves masters of Asia. An emperor of the Comnenian line, Alexius I., had asked aid against them of the Germans, and this in part gave rise to the first crusade. The Seljuk Turks became the most powerful of the Mohammedan powers in the 11th century. The Arab dynasty at Cordova had disappeared, while the Fatimite caliphs of Egypt had declined in vigor, and those of Bagdad had been conquered by the Seljuks in 1058. This made them the foremost aggressors against Christendom, and especially the Eastern empire. They conquered Armenia, invaded Syria and Palestine, and established themselves in Asia Minor, where they founded the kingdom called Roum, extending from Mount Taurus to the Bosporus. The forces of the empire, which should have been employed against the Seljuk Turks, were wasted in almost continuous civil wars; and



after the defeat of the Emperor Romanus by the Seljuk chief Alp Arslan at Manzikert in 1071, which may be regarded as the turning-point in the history of the empire, no serious effort was made to check the advance of the ruthless enemy. The Turks had reached the Hellespont, when the first crusade gave a much-needed relief. The Byzantine empire was too exhausted to make vigorous resistance, and would have fallen if the Latin and Teutonic Christians had not come to its relief. The enemy was driven back 200 miles, and was so badly beaten by the crusaders that for a hundred years he acted mainly on the defensive; and the empire recovered many of its richest Asiatic provinces, and, but for the faithlessness of Alexius I. (1081–1118) towards the crusaders, might also have recovered Syria, which, however, was divided up into Frankish kingdoms. The welter of obscure and incompetent emperors continued during the 12th century, and the empire began the 13th century with a Latin occupation (1204) by French and Venetian adventurers diverted from a crusade by the wily policy of Venice —an occupation which lasted for nearly sixty years, long enough to inflict irreparable injury upon the empire, which never recovered from the anarchy of this time. The feudal ideas of those adventurers, chief of whom was Baldwin, Count of Flanders, were rejected by most of the Asiatic provinces; and in these a succession of usurpers kept alive the idea of the empire till, in 1261, the Latins were driven out by Michael VIII., the founder of a new dynasty, the Palæologi, who ruled to 1282 with some energy and wisdom over a realm greatly shrunken in its European limits. In the interval the commercial importance of Constantinople, on which the prosperity of the empire had largely depended, had been reduced by the opening up, as a consequence of the crusades, of new avenues of trade with the East. Trading supremacy was transferred to the Italian cities, and much of the little energy that remained in the empire was dissipated in the fruitless struggle with Venice and Genoa. Thus the crusades, though embodying the Christian loyalty and zeal of that day, and in part preserving the Byzantine empire against the Turks, were in part injurious to those they primarily defended. The Greek emperors viewed the passing of the crusading hosts through their dominions with distrust. They looked upon some of the leaders as rivals and despoilers; their possessions were diminished; and they learned to regard their deliverers as enemies, and the 4th Crusade (1204) as an expedition for plunder.

The restoration of the empire was, however, followed by renewed activity on the part of the Turks; and the Western allies whom the weakness of Andronicus II. (1282–1328) called in did more damage to the empire than to the infidel. In the meantime the Turks—now the Ottoman or Osmanli Turks—deprived the empire of all its Asiatic possessions except a narrow strip opposite Constantinople (1333). In the civil war the usurper John Cantacuzenus (1341–55) called in the Turks to his aid, and succeeded in preserving his own cause by destroying the empire at which he had aimed. Thereafter it was a matter of years only. In 1354 the Turks made their first permanent settlement in Europe by the capture of Gallipoli. In 1361 Adrianople was taken by Murad, but the capital remained for yet a century the sole remnant of the Eastern empire. The Turks devoted themselves to fighting the Servians and the Bulgarians, and contemptuously allowed Constantinople to maintain a separate parochial history. For a moment in 1402 there was a prospect of relief, when the Tartar hordes under Tamerlane burst into Asia Minor, and the emperor of the East recovered, during the civil war which followed the defeat of the Turkish Bayazid at Angora, some of his ancient realms. But little use was made of the opportunity, and by 1444 Constantinople was again the limits of the empire. In 1452 came the final siege, and after a heroic defence the city was captured by Mohammed II. on May 29, 1453.

The verdict of history has become more favorable to the Byzantine empire. For centuries it remained the bulwark of Christianity against the Saracens and then against the Turks. It kept alive the tradition of classical learning during the dark ages in Western Europe, and it bequeathed to Eastern Europe a treasury of ideas and attainment in art, architecture, and religious thought which has profoundly influenced the life of its governments and peoples. Its organization was purely despotic, with no check except the ambitions of its provincial administrators who might rise in rebellion. Its commercial activity, resulting largely from its advantageous situation, linked East and West in beneficial intercourse for centuries until maritime discovery had mapped out new trade routes. The policy of the emperors was to destroy all local patriotism, and to remove from ambitious provincials the means of successful revolt. In this way the power of the empire to meet external attack was also weakened. In political development its achievement was small, its oriental cast of civilization being alien to the spirit of free institutions. See Gibbon's *Decline and Fall of the Roman Empire* (1827; new ed. 1903); Finlay's *Hist. of Greece* (1877); Bury's *History of the Later Roman Empire* (1889); Pears's *Fall of Constantinople* (1885); Rambaud's *L'Empire Grec au Xme Siècle* (1870); Heyd's *Histoire du com-*

Mosque of St. Sophia (exterior).

merce du Levant au Moyen Age (1885); Krause's *Die Byzantiner des Mittelalters in ihrem Staats-, Hof-, und Privatleben* (1869), and C. W. C. Oman's *The Byzantine Empire* (1886).

Byzantine Architecture. The foundation of a new and magnificent city gave a great impulse to architecture; and the meeting of East and West, Pagan and Christian, Greek and Roman, developed a new style in which the arch replaced the line of the architrave, and the universal use of vaulted roofs, especially in domical form, the flat roof of Greek temples, while the Roman basilica formed the basis of the whole, the dome rising from the centre of the cross. Thus the structural plan of Byzantine architecture remained fundamentally Roman, while the Roman method of construction in concrete with facings of brick and marble was exchanged for a more scientific system of building in brick alone, or alternately of brick and rubble, thus considerably reducing the areas of the supporting masses. The new style also exemplified the Gothic method of balancing thrusts by counterthrusts instead of by dead weight. Timber was never used in the vaulted roofs. 'The union of engineering skill with exquisite ornament,' such as marble panelling and mosaic, is characteristic. No less than seven forms of capital were evolved from the Greek columns by the Byzantine sculptors—the impost, melon, bowl, Byzantine Ionic, Byzantine Corinthian, bird and basket, and windblown acanthus. 'The union of the dome, on the grandest scale and in infinite variety, with arched ranges of columns in rows and in tiers—this was the unique triumph of Byzantine art, and nothing in the history of building has borne a fruit so rich.' The zenith of this art was reached under Justinian (526), when the architects Anthemius and Isodorus built the church of Sancta Sophia. The church of St. Sergius is also a famous example. Four periods may be noted: (1) 328 to 527 A.D.; (2) 527 to the end of the 8th century; (3) 9th to the 12th century; (4) 1204 to 1453 A.D. In W. Europe copies of Byzantine churches may be found at Ravenna (St. Vitale), Venice (St. Mark's), and at Monreale, near Palermo. From the 5th to the 11th century 'the Byzantine and Eastern world preserved the traditions and led the development of art in all its modes.'—*Mosaic*, especially *glass mosaic*—now being revived for mural decoration—was a strictly Byzantine art; so was *enamelling*, now the heritage of W. Europe. The Pala d'Oro at St. Mark's is of Byzantine origin. *Ivory carving* and *jewelry* were produced abundantly, *miniature and fresco painting* cultivated with success. *Le Manuel d'Iconographie Chrétienne* (published 1845), found in the hands of the monks of Mt. Athos, and as old as the 11th century, describes fully the designs and processes. *Metal work* was highly artistic, as may be seen in the bronze doors at Amalfi. *Numismatic art* was considerable, if not supreme. *Silk and satin embroidery* was a Greek monopoly, and we read of a senator's robe adorned with 600 figures representing the life of Christ. And the Dalmatic of the Vatican is renowned. *Samite* is Greek for six-threaded stuff. *Cendal* is σινδοων, a kind of muslin or taffeta. *Imperialis* was stuff supplied only to the great. *Greek manuscripts*, though in lettering inferior to the Irish, are in miniature painting superior, and the Vatican and Paris specimens unsurpassed. In *music*, Greek notation was, during the first six hundred years of the Christian era, in universal use, and for the next four hundred with slight modifications, till the change introduced by Guido Arezzo in the 11th century. The Emperor Copronymus sent to Pippin the first organ seen in Western Europe.

Byzantine Literature. 'The peculiar indispensable service of Byzantine literature was the preservation of the language, philology, and archæology of Greece.' From Proclus (5th century) there were never lacking students of the philosophy of Plato and Aristotle. Geometry and astronomy were kept alive, if not much improved. The architects of St. Sophia were mathematicians, and wrote on mechanics. Leo (9th century) lectured on geometry, and composed an essay on Euclid. Michael Psellus (11th century), 'prince of philosophers,' treated of mathematics and astronomy. From the 4th to the 11th century there was a regular series of writers on medicine, zoology, botany, mineralogy, and geography. (See Krumbacher's 1,200 pages.) Epigrammatists formed a class to themselves. Grammarians, scholiasts, lexicographers produced much useful work and the *Etymologicum Magnum*. Much of the best intellect of the times was absorbed in theological problems, and Chrysostom, Cyril, Methodius, the Patriarch Photius, Gregory of Nazianzus are great names in the Eastern Church. Amongst poets were Pisides, Theodosius, Leo, Tzetzes, and the Silentiary Paul, who wrote on St. Sophia. Civil law is represented by the great compendium in sixty books inspired by Basil but published by Leo VI. Historians who wrote on universal history, or of their own city and its customs, are legion, and Gibbon is the only guide through a maze of names that include emperors, generals, and statesmen. Their works, first printed at Paris in thirty-six volumes by Labbé (1654–1711), and reprinted at Venice (1727–33), were incorporated in forty-eight volumes by Niebuhr and others, under the name *Corpus Scriptorum Historiæ Byzantinæ* (1828–53). Procopius wrote Byzantine History; Eusebius, Universal History; Proxagoras, History of Constantine; Zonaras, Annals; Nicetas Acominatus, History of Byzantine Emperors. Other names of authors, covering with their works the period 553–1463, are Agathias, Anna Comnena, Cinnamus, Nicephorus Gregoras, John Cantacuzenus (emperor), Michael Ducas, Chalcocondyles. They are valuable not for what they originate, but for what they preserve. Cinnamus and Ducas make some claim to philosophic history, Anna Comnena to artistic skill. See Harrison's *Byzantine History in the Early Middle Ages* (1900); Schlumberger's *L'Epopée Byzantine* (1896); Lethaby and Swainson's *A Study of Byzantine Building* (1894); Krumbacher's *Geschichte der Byzantinischen Literatur* (1897); Bayet's *L'Art Byzantin* (1892).

Byzantium, tn. on the Thracian Bosporus, the forerunner of the modern Constantinople, founded by the Megarians in 667 B.C. Its situation was highly advantageous in many ways. It had a deep harbor, was without tides, and it commanded the grain trade between the merchants of the W. and the people on the N. shores of the Euxine Sea. During the 5th and 4th centuries B.C. it was for the most part included among the states subject to Athens, except that from 515 to 478 B.C. it was subject to Persia. From the middle of the 4th century B.C. until it was merged in the Roman empire the town enjoyed independence. Its inhabitants had almost from the first been of mixed character, and they were commonly regarded as of a profligate and frivolous disposition. In 196 A.D. it was destroyed by Severus, after a long siege. At first he treated the inhabitants with great cruelty, and put many of them to the sword, but he afterward rebuilt part of the city, made baths, and improved the hippodrome. Its excellent site caused the emperor Constantine to choose it for the capital of the Eastern empire in 330 A.D., when it was called Constantinopolis. See Byzantine Empire.

C

C. Before the 3rd century B.C. there was no distinction between C and G; they were one letter, with the original value *g* (see G), and the later value *k*. After G came into use, C was left with the value *k*. With this sound it passed to Britain, and it is still so used in Welsh. But *k* is a sound very liable to change, under the influence of a consonantal *i*, which tends to slip in after it (dialectic English *cyar* = 'car'). Hence C in the alphabets derived from the Latin (English, French, German, Italian, etc.) has acquired a number of different sounds, such as *tsh, ts, sh, s*. In the English name it is now pronounced *s*, and this is generally its sound before *e, i,* and *y*; it is a value largely due to French influence after the Norman conquest. Other English sounds are *z* and *sh* ('sacrifice,' 'officiate').

Ch is used in the alphabets derived from the Latin to express various sounds originating in *c* = *k*. In phonetics it is best to use it for spirant *k*, Greek χ, its value in German and Welsh (*cf.* Scottish 'loch'). Its principal English value is that found in 'church,' and is due to Old French influence. The modern French value also appears in English ('machine').

The form of C has varied very little since it was distinguished from G. Regarding c, see Z.

C, in music (called on the Continent DO or UT), is the tonic of the 'natural' scale—*i.e.* that which has neither sharps nor flats. The key of C minor flattens E and A.

Caaba. See KAABA.

Caacate, or CAACATI, tn., prov. Corrientes, Argentina, 77 m. S.E. of Corrientes. Pop. 5,000.

Caa'ing Whale. See CA'ING WHALE.

Caazapa, tn., Paraguay, 188 m. S.E. of Asuncion, and on a railroad through some of the principal cities. Pop. 12,000.

Cab. A kind of vehicle called a cabriolet (its springing motion was supposed to resemble that of a kid) was in existence about the middle of the 17th century in Paris, and by the middle of the following century cabriolets came into general use. The original vehicle was a hooded gig on two wheels with room inside for only one passenger, beside whom sat the driver. In the beginning of the 19th century an effort was made to introduce cabriolets into Great Britain, to supersede hackney carriages. It was not until 1823 however, that licenses were obtained for cabs. At first their number was limited to twelve. These were of an improved pattern with a folding hood, and seated for two passengers, the driver being separated from them by a partition. In 1832 all restrictions were removed, and cabs came into popular favor. In 1836 a cab on four wheels, the precursor of the brougham, was introduced, and from this the present four-wheeler is descended. In 1834 a patent was taken out for an improved two-wheeled safety cab by Mr. Hansom, the architect of Birmingham town hall. The safety consisted in an arrangement of the framework which prevented the cab tilting backwards or forwards in case of accident. These cabs had a small body, hung between wheels of over seven feet diameter; but two years afterwards a fresh patent was obtained for an improved hansom, on the lines of the present vehicle. Great improvements have taken place both in the hansom and the four-wheeler as regards smartness, lightness, and convenience. By means of a folding framework cover both may be used open or closed, and since the introduction of india-rubber tires a remarkable degree of smoothness in running has been attained. Cabs in the United States are mostly under police or municipal regulation in the matter of fares, stands, etc., each city having its own by-laws on the subject. Motor cabs were introduced generally about 1900, and are extensively found in the large cities of the U. S.

Cabal, a secret understanding between the members of a clique or party, and by transference denoting the clique itself. Charles II.'s cabinet was (1667-73) styled the 'Cabal,' not only because the term was considered peculiarly appropriate, but also because the initials of the noblemen forming the cabinet (Clifford, Ashley, Buckingham, Arlington, Lauderdale) made the word *cabal.*

Caballero, FERNAN, pen-name of CECILIA FRANCISCA JOSEFA BOHL DE FABER (1796-1877), Spanish novelist, of German parentage, until recently one of the most popular novelists in Spain and largely read in England. Her best-known work is *La Gaviota*—'The Seagull' (1867); *Clemencia* also is well known. Any value her works may possess depends upon her pictures of rural life in Andalusia, which are very true and racy. Although not so popular as *La Gaviota*, the *Cuadros de Costumbres Populares Andaluces* (1852; Eng. trans., *National Pictures*, 1882) is probably the most attractive book.

Cabanatuan, pueb., Nueva Ecija prov., Luzon, Philippine Is., 13 m. N. of San Isidro, on the Rio Grande de la Pampanga, and on the main road. Pop. (1903) 7,109.

Cabanel, ALEXANDRE (1823-89), French artist, born at Montpellier; studied painting under Picot and in 1863 became professor at the Ecole des Beaux-Arts, Paris. His works include *The Agony of Christ*, *The Death of Moses* (1852), *The Christian Martyr*, *Michelangelo*, *The Birth of Venus* (1863), *Adam and Eve*, *Death of Francesca da Rimini* (in the Luxembourg, Paris), and *Scenes from the Life of St. Louis* (in the Panthecn, Paris). But he was chiefly famous for having painted women of the French aristocracy. Many of his pictures and portraits are owned in the U. S. His portrait of Miss Catherine Wolfe is in the Metropolitan Museum of Art, New York, and the *Birth of Venus* (replica), and his *Queen Vashti and King Ahasuerus* are in the same museum. The Corcoran Gallery at Washington contains his *Death of Moses.* See Stranahan's *History of French Painting* (1899).

Cabanis, PIERRE JEAN GEORGES (1757-1808), French physician and writer, was born at Cosnao (Corrèze). After being physician to Mirabeau, he was appointed clinical professor in Paris in 1797, and became a member of the Council of the Five Hundred, and, under Napoleon, of the Senate. His *Traité du Physique et du Moral de l'Homme* (1802) is imbued with the ideas of Locke and Condillac, and exercised considerable influence at the beginning of the 19th century. He also wrote several books on medicine—*e.g. Coup d'Œil sur les Révolutions et la Réforme de la Médicine* (1804).

Cabatúan, pueb., Iloilo prov., Panay, Philippine Is., 15 m. N.W. of Iloilo on a trib. of the Suague R. Rice and sugar cane may be raised at the greatest advantage, but native enterprise is at a low ebb. Pop. (1903) 16,497.

Cabbage (*Brassica oleracea* var., *capitata*), one of our most important vegetables. It is a native of Europe and is extensively grown in all temperate climates. It is eaten cooked in various ways, raw as a salad, and salted and cured as kraut. The edible portion consists of a head of densely packed leaves, which varies in weight from 3 to 10 or 12 pounds. The cabbage is a hardy plant, easily grown and does well on most any fertile, well drained, friable soil. Loams are preferred. They should be made rich by heavy applications of well rotted stable manure. In market gardening sometimes as much as 80 to 100 tons per acre are applied. The crop does well after clover or other legumes. It should be grown in rotation with other crops to avoid certain diseases which affect it.

There are white cabbage, red cabbage, and crinkly leaved or Savoy cabbage, with early, medium, and late maturing varieties of each. Early Jersey Wakefield and Very Early Winningstadt are two of the best early white varieties. These mature in from 90 to 100 days from the time the seed is sown, and are of the best quality. The various strains of Flat Dutch and Drumhead varieties are among the best for late white cabbages. The Red Dutch is an excellent red variety. The Savoy cabbages, while the best in quality of all the cabbages, give a relatively light yield and hence are less extensively grown. Drumhead, Savoy, and Marvin Savoy are excellent sorts.

Cabbages are usually started in hotbeds, cold frames, or window boxes, and transplanted to the field as soon as weather conditions permit. In field culture the plants are set in rows 2½ ft. apart and about 2 ft. apart in the row. This distance permits of horse cultivation both ways, which should be shallow and frequent. In transplanting set the plants in the soil up to the first leaves, firmly pack the soil around the roots, leaving a little loose soil on top to retard drying out. Choose a cloudy day or late afternoon for transplanting and in dry weather, pour about a half-pint of water before setting in the hole made to receive the plant. The bulk of the cabbage crop should be marketed in the fall to avoid losses in rotting from storage. When storage is desirable, pull the cabbage when dry and not frozen, leaving the roots on. It keeps well in a cold, damp cellar, or stored in long, shallow, narrow trenches, out of doors. Place the heads down and the roots up, with not over 2 or 3 tiers of heads in one trench. Cover over with straw and dirt to prevent serious freezing. If there be any secret in successfully storing cabbage, it is to keep it cool and moist, but not wet.

Clubroot (*Plasmodiophoria brassicæ*) and black rot (*Pseudomonas campestris*) are perhaps the most serious diseases of cabbage, and both are best controlled by rotation methods, but should not follow turnips, mustard, radishes, or related plants.

Paris green is an effective remedy against most of the insects which eat the leaves of cabbage. This is mixed in the proportion of 1 part Paris green to 6 parts flour, and applied when the plants are moist with dew or rain.

Cabbage Butterfly, a large white butterfly (*Pieris brassicæ*), common in gardens in summer in both Europe and N. America.

Cabbage Butterfly, with larva and pupa.

There is also another smaller species. The eggs are laid on the under surface of the leaves of cabbages and other cruciferous plants, and hatch in about a fortnight, giving rise to bluish-green larvæ. These are exceedingly voracious, and very destructive to the host plants. When full fed the larvæ quit the host plant, and pupate on walls, trees, etc. The autumn brood remains in the pupa stage till spring, and then hatching gives rise to the early butterflies, whose offspring form the butterflies of full summer. In fine seasons there may even be three generations for the rate of development depends upon the weather.

Cabbage Fly (*Anthomyia*, or *Phorbia*, *brassicæ*), a dipterous insect which in appearance closely resembles the common house fly. The larvæ attack the stalks of cabbages and other vegetables, and often cause great destruction.

Cabbage Fly, with larva and pupa.

Other closely similar species infest radishes, lettuce, etc., the genus being a very large one. Spraying with some insecticide is necessary to destroy the pest.

Cabbage Palm, or CABBAGE TREE (*Areca oleracea*), a native of the W. Indies, where it often attains a height of 100 feet, is a handsome tree with a trunk free from the remains of the leaf-sheaths of dead leaves. The terminal bud, the 'cabbage' and the interior of the stem are edible, pickled or boiled. The cabbage-palm of the Southern United States, whose head is also eaten, is the sabal-palmetto (*Sabalpalmetto*).

Cabbala (from Heb *gabbalah*, 'what is received,' 'tradition'), an ancient Jewish system of religious philosophy or theosophy, said to have been given by God to Adam. According to some, the system was lost at the time of the Babylonian captivity, but was subsequently revealed to Ezra; and it has been held that the famous cabbalistic volume *Sohar*, a mystic commentary on the Pentateuch, was the work of Simon ben Jochai (A.D. 72–110). Dr. Ginsburg and others, however, believe that, for the purpose of opposing the philosophical system of Maimonides, the Cabbala was founded by Isaac the Blind and his disciples, Ezra and Azariel of Zerona, between 1200 and 1230 A.D. Some of its dogma are akin to Christian tenets, and it was influenced in a considerable degree by Greek Neo-Platonism. The chief contention was that God is without end, and boundless, without will, intention, desire, or action; but that there have emanated from Him ten *sephiroth*, or intelligences, the first being called the Inscrutable Height, the names of the others being, in order, Wisdom, Intellect, Grace, Power, Beauty, Firmness, Splendor, Foundation, and Authority. The Cabbala teaches the doctrine of the transmigration of souls, and has exercised great influence upon the intellectual development of the Jews. Raymond Lully, Pope Sixtus IV., Pico della Mirandola, and Reuchlin were all more or less interested in the Cabbala. See Ginsburg's *The Kabbalah* (1865); Knorr von Ro-

Cabbage Palm.

Insert in Vol. II, at page **422.**

President Harding's Cabinet, 1921

On March 4, 1921, following his inauguration as the twenty-ninth president of the United States, Warren G. Harding officially presented to the Senate the following names of men chosen by him to constitute his Cabinet, and they were immediately confirmed.

Secretary of State: Charles Evans Hughes of New York.

Secretary of the Treasury: Andrew W. Mellon of Pennsylvania.

Secretary of War: John W. Weeks of Massachusetts.

Attorney General: Harry M. Daugherty of Ohio.

Postmaster General: Will H. Hays of Indiana.

Secretary of Navy: Edwin Denby of Michigan.

Secretary of Interior: Albert B. Fall of New Mexico.

Secretary of Agriculture: Henry C. Wallace of Iowa.

Secretary of Commerce: Herbert C. Hoover of California.

Secretary of Labor: James J. Davis of Pennsylvania.

Brief biographies of these men follow. Their portraits appear on the next page.

Hughes, CHARLES EVANS (1862), Secretary of State, was Republican candidate for the presidency of the United States in 1916, but was defeated by Woodrow Wilson (q. v.). He was engaged in the practice of law from 1917 to 1921, when he was named by President Harding as Secretary of State. For a more detailed biography, see HUGHES, CHARLES E.

Mellon, ANDREW WILLIAM (1852), Secretary of the Treasury, banker, was born in Pittsburgh, and was educated at the University of Pittsburgh. He entered the banking business in 1874 and became president of the Mellon National Bank in 1902. He founded the town of Donora, Pa., where he erected some of the largest steel mills in the world, and, with his brother, established the Mellon Institute of Industrial Research in Pittsburgh. He is a trustee of the University of Pittsburgh and is identified with many charitable and welfare organizations.

Weeks, JOHN WINGATE (1860), Secretary of War, served in the U. S. House of Representatives from 1905 to 1913 and in the Senate from 1913 to 1919. In the Republican National Convention of 1916 he received 105 votes for the presidential nomination. See WEEKS, JOHN W.

Daugherty, HARRY M. (1860), Attorney General, lawyer, was born in Washington Court House, Ohio, and was graduated from the University of Michigan in 1881, and later from Ohio State University Law School. He was elected to the Ohio State Legislature (1889) and served one term; was chairman of the Republican State Central Committee (1898); and was candidate for nomination for Governor of Ohio (1899), but was defeated. He has been a close friend and political advisor of President Harding for twenty years and has been extremely active in Ohio politics.

Hays, WILL H. (1879), Postmaster General, lawyer, was born in Sullivan, Indiana, and has practised law in his native town since 1900. He became chairman of the Republican National Committee in 1916. He is progressive in tendency and was for a time opposed by the reactionary forces of his party.

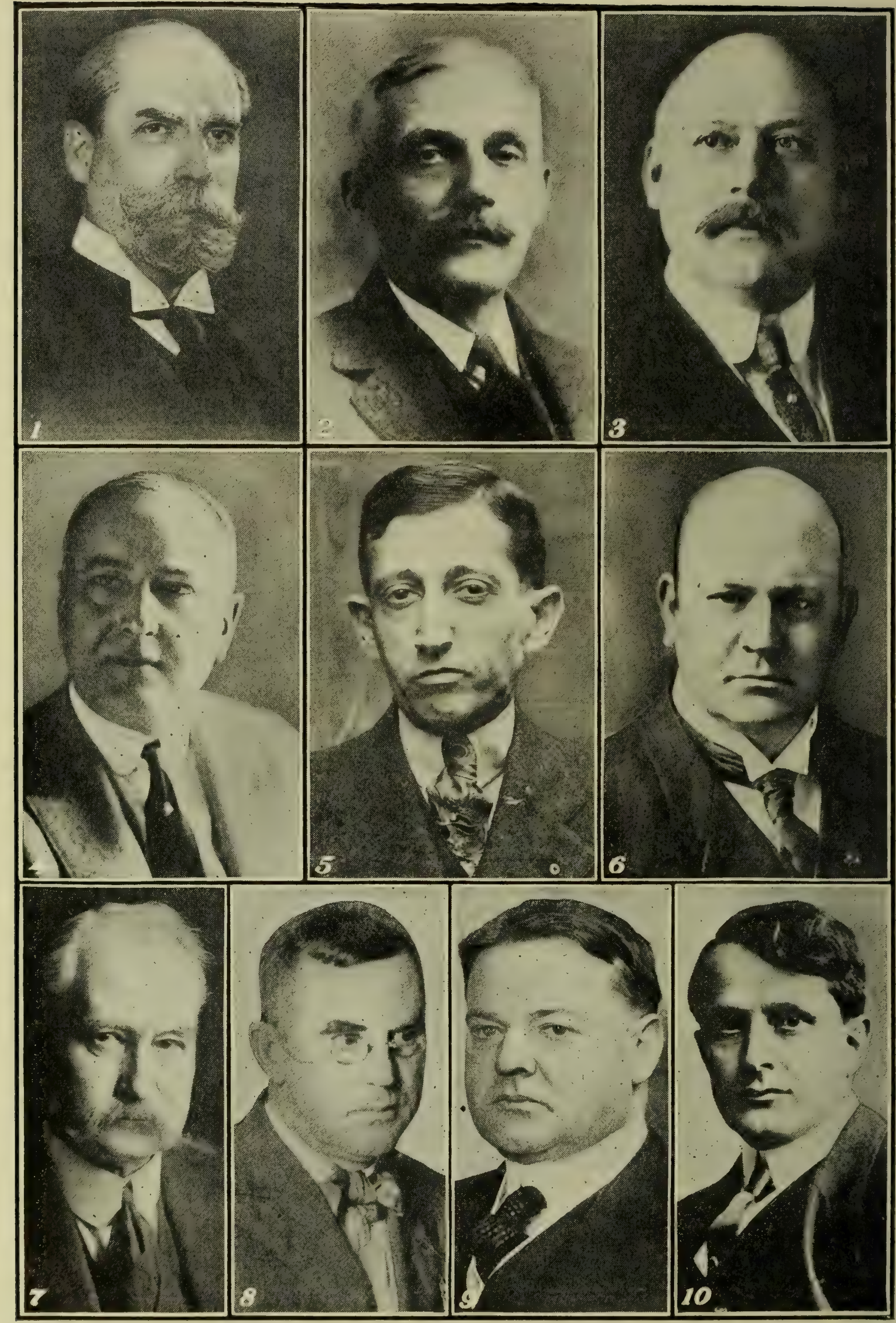
Denby, EDWIN (1870), Secretary of the Navy, was born in Evansville, Indiana, and in 1885 went with his father (then U. S. Minister) to China, where he was for ten years (1887–97) in the Chinese customs service. After his return to America he was graduated from the University of Michigan (LL.B.) and was admitted to the bar. In 1905 he was elected to Congress from the 1st Michigan district, and served for three successive terms. He served as a gunner's mate in the Spanish-American War and n the United States Marine Corps during the World War. He is a member of the law firm of Chamberlain, Denby, Webster and Kennedy, of Detroit.

Fall, ALBERT BACON (1861), Secretary of the Interior, was born in Frankfort, Kentucky, and obtained his education in country schools. When a young man he taught school and read law and later was engaged in farming, ranching, and mining. He served in the New Mexico legislature and as associate justice of the New Mexico Supreme Court, and in 1912 was elected U. S. Senator from New Mexico, where he remained until chosen a member of the Harding cabinet.

Wallace, HENRY C. (1866), Secretary of Agriculture, editor and publisher, was born in Rock Island, Illinois, and was educated at Iowa State College, where he was professor of dairying from 1893 to 1895. He was engaged in farming and the breeding of livestock in Iowa (1887–91), was editor of the *Creamery Gazette* and *Farm and Dairy* (1893–5), and manager and associate editor (1895–1916) and editor (after 1916) of *Wallace's Farmer*. He was a member of the National War Work Council of the Y. M. C. A. and chairman of the Iowa State committee of that organization.

Hoover, HERBERT CLARK (1874), Secretary of Commerce, earned distinction during the World War and subsequently as chairman of the Commission for Relief in Belgium, U. S. Food Administrator, and chairman of the European Relief Council. See HOOVER, HERBERT C.

Davis, JAMES JOHN (1874), Secretary of Labor, was born in Tredegar, Wales, and began work, when a small boy, as a puddler in steel mills. In 1893 he went to Elwood City, Indiana, where he held several city and county offices. He was for many years president of the Amalgamated Association of Iron, Steel, and Tin Workers of America, and has been an active leader in union affairs.



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PRESIDENT HARDING'S CABINET, MARCH 4, 1921.

1. Charles Evans Hughes, Sec'y of State. 2. Andrew W. Mellon, Sec'y of Treasury. 3. John W. Weeks, Sec'y of War. 4. Harry M. Daugherty, Attorney General. 5. Will H. Hays, Postmaster General. 6. Edwin Denby, Sec'y of Navy. 7. Albert B. Fall, Sec'y of Interior. 8. Henry C. Wallace, Sec'y of Agriculture. 9. Herbert C. Hoover, Sec'y of Commerce. 10. James J. Davis, Sec'y of Labor.

senroth's *Cabbala Denudata* (1677–78), and its English translation, *The Cabbala Unveiled;* Waite's *Doctrines and Literature of the Cabbala* (1907), and *The Secret Doctrine in Israel* (1913); Pick's *The Cabbala, and Its Influence* (1912).

Cabeiri, kȧ-bī′ri, or Cabiri, ancient mystic divinities chiefly worshipped at Samothrace, Lemnos, and Imbros, but also at Thebes, Pergamos, and elsewhere. They are identified by some with Demeter, Persephone, and Rhea; by others with the Dioscuri (Castor and Pollux); by others again with the Roman Penates.

Cabell′, James Branch (1879–), American author, was born in Richmond, Virginia. He was graduated from William and Mary College in 1898, and took up newspaper work. He was on the staff of the New York *Herald* (1899–1901), and the Richmond *News* (1901) and in 1902 began contributing to magazines and periodicals. Besides his own literary work he acted as genealogist to the Virginia Sons of the Revolution, and as historian to the Virginia Society of Colonial Wars and the Virginia Sons of the American Revolution. His published works include *The Eagle's Shadow* (1904); *The Cords of Vanity* (1909); *Domnei* (1913); *The Rivet in Grandfather's Neck* (1915); *The Cream of the Jest* (1917); *Beyond Life* (1919); *Jurgen* (1919); *Figures of Earth* (1921); *The High Place* (1923); *Straws and Prayer Books* (1924); *The Silver Stallion* (1926); *The Music from Behind the Moon* (1926); *Something about Eve* (1927).

Ca′ber, Tossing the, a Scottish sport in which a large beam or young tree, heavier at one end than the other, is held perpendicularly balanced against the chest, small end downward, and tossed so as to fall on the heavy end and turn over, the farthest toss and straightest fall winning.

Cabes, kä′bes, or Gabes (ancient *Tacapœ*), port of Tunis, at the head of the Gulf of Cabes; 200 miles south of Tunis city. It exports esparto grass, dates and other fruits, henna and wool. Pop. 12,000.

Cabet, kȧ′bā′, Etienne (1788–1856), French communist, was born in Dijon, and was educated as a lawyer. He was *procureur-général* of Corsica (1830–31), and deputy for the department of Côte-d'Or (1831). In 1833 he founded a radical Sunday paper, *Le Populaire;* and because of an article in it was obliged to flee to England. In 1839 he was again in Paris, where he published his *Histoire populaire de la révolution française* (1840), and *Voyage en Icarie* (1842). The latter, advocating utopian and communistic ideas, resulted in the emigration of a French colony—mainly consisting of Parisian workingmen—to Texas in 1848, where the *New Icarian* community was founded (see Communistic Societies).

Cabeza del Buey, kä-bā′thä del bo͞o-ā, town, Southwest Spain; 95 miles southeast of Badajoz. It has tanneries and cotton and cork industries. Pop. (1920) 7,417.

Cabinda, kä-bēn′dä, or Kabinda, district and seaport, Angola, Portuguese West Africa, north of the mouth of the Congo. Pop. 10,000.

Cab′inet, the body of advisers to the head of a nation, who are usually charged also with the administration of various executive departments. The two principal types of cabinet are well illustrated in the cabinets of the United States and Great Britain.

United States.—The cabinet is composed of the heads of the executive departments, whose function is to advise the President upon important questions of policy, upon which advice he is under no legal obligation to act. The cabinet members are appointed by the President, at an annual salary of $12,000, and are subject to confirmation by the Senate; they are responsible only to the President; and they may be removed by him at will. The cabinet meets at the White House, at the call of the President; no records of the meetings are kept; and the proceedings are not officially made public.

While no provision was made in the Constitution for the creation of such a body, the establishment of executive departments was evidently assumed in the statement providing that the President might 'require the opinion in writing of the principal officers in each of the executive departments, upon any subject relating to their respective offices.' Congress, accordingly, in 1789 created the Departments of State, War, and the Treasury. President Washington called for the written opinion of the heads of these departments; and from time to time assembled them together with the Attorney General, for consultation. Under John Adams the Navy Department was created, and the Secretary of the Navy was added to the cabinet. Jefferson developed the idea of systematic conferences, and emphasized party harmony, and during his administration the office of Postmaster-General was added. In 1849 the Secretary of the Interior joined the cabinet, in 1889 the Secretary of Agriculture, and in 1903 the Secretary of Commerce and Labor. In 1913 the Department of Commerce and Labor was divided into two departments, and their respective heads became members of the cabinet, bringing the total to ten.

Great Britain.—The cabinet is composed of the chief Ministers of the Crown, who sit in the legislature, and who are jointly responsible for the government of the country. The prime minister is appointed by the Crown, and the other cabinet members by the prime minister. The responsibility of the cabinet is to the House of Commons, an adverse vote of which on an important matter leads to the resignation of the cabinet as a whole.

The British cabinet dates from the time of William iii. In Pitt's time (1783) it consisted of himself and seven peers. After this the number gradually increased; it is not fixed but is never less than eleven; in 1927 it was twenty-one. The cabinet invariably includes the prime minister and first lord of the Treasury, lord president of the council, chancellor of the exchequer, lord chancellor, and five secretaries of state (home affairs, foreign affairs, colonies, war, and India). Other members in 1927 were lord privy seal, first lord of the Admiralty, president of the Board of Trade, minister of health, minister of labor, secretary of state for air, minister of agriculture and fisheries, president of the Board of Education, secretary for Scotland, chancellor of Duchy of Lancaster, first commissioner of works, and attorney general.

Owing to the large numbers composing the British cabinet it is inevitable that the real conduct of government should fall into the hands of an 'inner cabinet.' During the Great War a small cabinet, consisting of the prime minister and first lord of the treasury, lord president of the council, four ministers without portfolio, and the chancellor of the exchequer—seven in all—formed the war cabinet, which directed hostilities and also served the purposes of an ordinary cabinet.

Consult Blauvelt's *Development of Cabinet Government in England;* Bryce's *American Commonwealth* (new ed. 1914).

Cabinet Noir, a former French government department, engaged in opening private letters and reading them. It was organized under Louis xiv., was disestablished during the Revolution, but again established by Napoleon, and existed in France until the last years of the restoration. A similar office existed in Imperial Russia.

Cabiri, ka-bī′rī. See CABEIRI.

Ca′ble, a large rope or chain of iron links, especially such as may be used for holding a vessel to her anchor. Rope cables are made of hemp, jute, coir, or wire; but these have been largely superseded by chain cables. The latter are usually of eight lengths of 15 fathoms each. Those used in the U. S. Navy have a swivel 5 fathoms from the anchor, and neither swivel nor shackle from that point to 45 fathoms.

As a measure of length at sea, a cable equals 100 fathoms, or the tenth part of a nautical mile. The term is sometimes used to signify a cable's length—*viz.*, 120 fathoms. For Submarine Cables, see TELEGRAPHY. See ANCHOR; CHAIN; ELECTRIC CABLES.

Cable, GEORGE WASHINGTON (1844–1925), American author, was born in New Orleans, of New England and Virginia stock. He served in the Confederate Army during the Civil War; and was afterward a member of the New Orleans *Picayune* staff (1865–79). His literary reputation was established at this time by his sparkling and tender sketches of the Latin Quarter of New Orleans and of Southern plantation life, which first appeared in *Scribner's Monthly*. After 1885 he made his permanent residence in Northampton, Mass. He was a member of the American Academy of Arts and Letters. His published works include *Old Creole Days* (1880), a collection of his early sketches; *The Grandissimes* (1880); *Madame Delphine* (1881); *Dr. Sevier* (1883); *The Creoles of Louisiana* (1884); *Bonaventure* (1888), a collection of short stories; *John March, Southerner* (1894); *Strong Hearts* (1899); *The Cavalier* (1901); *Bylow Hill* (1902), *Kincaid's Battery* (1908); *Possom Jone' and Père Raphael* (1909); *Gideon's Band* (1914); *The Amateur Garden* (1914).

Cableway. See ROPEWAYS.

Cabot, kab′ut, GEORGE (1751–1823), American public official, was born in Salem, Mass., and studied at Harvard. He went to sea as a cabin boy, and afterward became a successful shipowner. He was a member of the provincial congress of Massachusetts (1776); of the State constitutional convention (1779–80); and of the convention which ratified the Constitution of the United States. He was United States Senator from 1791 to 1796; and declined the appointment as first Secretary of the Navy (1798). He was a leader of the Federal Party, and an advocate of strong centralized government. In 1814 he served as president of the Hartford Convention (q.v.).

Cabot, JOHN, or GIOVANNI CABOTTO (*c.* 1450–98), discoverer of the North American mainland, was a Genoese, naturalized in Venice, who settled about 1490 as a merchant in Bristol, England. Under letters patent from Henry VII. he sailed from Bristol in 1497, with two vessels, and on June 24 sighted Cape Breton Island and Nova Scotia. In 1498 he sailed again from Bristol, with a small fleet of five ships; but of the fate of this expedition nothing more was ever heard.

Cabot, SEBASTIAN (1474–1557), son of John Cabot (q.v.), was probably born in Venice. He is said to have accompanied his father on his first voyage of discovery (1497); and in 1499 he appears to have sailed with two ships in search of a Northwest Passage, and followed the American coast from 60° to 30° N. lat. He attained some fame in England as a cartographer, and in that capacity later entered the service of Ferdinand V. of Spain (1512). In 1519 Cabot was appointed pilot major by Charles V. of Spain, for whom, in 1526, he commanded an expedition which examined the coast of Brazil and La Plata, where he endeavored to plant colonies. The attempt ending in failure, he returned to Spain (1530), and was imprisoned for a year, and banished for two years to Oran, in Africa. In 1533 he obtained his former post in Spain; but in 1547 once more betook himself to England, where he was well received by Edward VI., who made him inspector of the navy, and gave him a pension. He was among the first to notice the variation of the magnetic needle in different places. In 1553 he was the director of the expedition of Merchant Adventurers which opened to England an important commerce with Russia.

Cabot Strait, between Newfoundland and Cape Breton Island, forms an entrance to the Gulf of St. Lawrence, 60 miles wide.

Cabra, kä′brä, town, Spain, in the province of Cordova; 32 miles southeast of Cordova. It is an ancient city, with an old castle, and has jasper quarries. Its wine is much esteemed. Pop. 13,500.

Cabral, kä-bräl′, or CABRERA, PEDRO ALVARE (*c.* 1460–1526), Portuguese navigator. In 1499 the king placed him in command of a fleet of 13 vessels, with 1,200 men, bound for the East Indies. He took a course too far westerly, fell into the South American current of the Atlantic, and was carried to the unknown coast of Brazil, of which he claimed possession for the king of Portugal. He then sailed for India; landed at Mozambique, of which he first gave clear information; and sailed thence to Calicut, where he made the first commercial treaty between Portugal and India.

Cabrera, kā-brā′rä, one of the Balearic Islands (q.v.), used as a penal settlement; area, 8 square miles.

Cabrera, RAMON, COUNT OF MORELLA (1810–77), Spanish general, was born in Tortosa, of humble parents. When the death of Ferdinand in 1833 gave the signal for civil war, he joined the partisans of Don Carlos, and during the next seven years valiantly but somewhat cruelly led the Carlist soldiers against the Christinos. He overthrew the royal army at Buñol and at Burjasot, and threatened Madrid itself; but in 1840 he suffered a total defeat, and was driven across the French frontier. In 1845 he opposed Don Carlos' abdication, and in 1848 renewed the struggle; but early in 1849 was forced to recross the Pyrenees. He afterward lived in England.

Cabriolet. See CAB.

Cabul, kä′bo͞ol *or* kä-bo͞ol′. See KABUL.

Cacao, ka-kā′ō. See COCOA.

Cacao Butter, or OIL OF THEOBROMA, the concrete oil obtained by crushing and heating the seeds of *Cacao theobroma*. It is easily melted and is used medicinally to form suppositories.

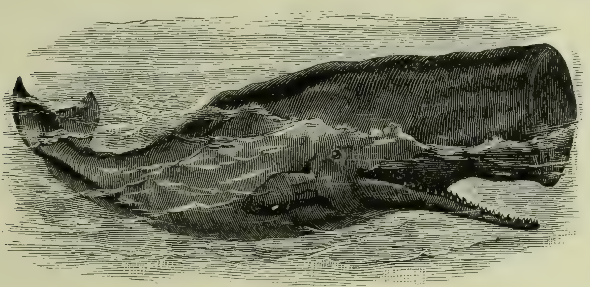
Caccini, kat-chē′ne, GIULIO (1550–?1615), Italian musical composer, was born in Rome. After 1565 he was musician at the court of Florence, and took a leading part in the efforts to revive the dramatic music of the ancients. To this end he composed the dramas *Il Combattimento d'Apolline col Serpente* (1590), *Dafne* (1594), and *Euridice* (1600).

Cacéres, kä′thā-rās, province, Estremadura, Spain, intersected by the River Tagus; area, 7,667 square miles. On the north of the river, fruit, wine, and oil abound; on the south, grain and pasturage. Pop. (1923) 409,148.

Caceres, city, Spain, capital of Caceres province, on the River Tagus; 50 miles northeast of Badajoz. It has manufactures of bacon, linen, woollens, and leather. The city, founded as *Castra Cæcilia* by the Romans in 74 B.C., was taken from the Moors in 1225. Pop. (1920) 17,830.

Caceres, Philippine Islands. See NUEVA CACERES.

Cachalot, kash′a-lot, or SPERM WHALE (*Physeter macrocephalus*), one of the largest of living animals, is commonest in tropical and sub-tropical seas, especially toward the south, and is absent from both Polar seas. The diet consists mainly of cuttle-fish and the cachalot, a powerful swimmer, descends to great depths in search of them. It is said to remain under water as long as twenty minutes at a time. It was hunted with great ardor during the earlier half of the 19th century, and has greatly diminished in numbers in consequence. The high commercial value depends upon (1) the quality of the oil (sperm oil) made from the blubber; (2) the spermaceti, a valuable oil contained in a cavity on the upper part of the great head; (3) the ambergris, a concretion formed within the intestine of the whale, and found both there and on the surfaces and beaches of the seas haunted by the cachalots. Ambergris is used as a basis in perfumery, and was formerly also employed as a drug. The teeth of the cachalot furnish valuable ivory. Consult F. Beddard's *Book of Whales* (1900); and for a popular description of the hunting methods, see F. T. Bullen's *The Cruise of the 'Cachalot'* (1898).



The Cachalot, or *Sperm Whale*.

Cachar Plains, a dist. in the Surma Valley division of Assam, India, between Sylhet on the W. and Manipur on the E. It is one of the great tea-producing regions of Assam, grows large quantities of rice, and exports timber to Bengal. Chief town Silchar. Area, 2,063 sq. m. Pop. (1901) 414,781. See also NORTH CACHAR.

Cache, riv., Ark., rises in Clay co., the N.E. corner of the state, and flows 230 m. in a general S.S.W. direction to Monroe co., where it joins the White R. near Clarendon.

Cacheo, riv., W. Africa, between Gambia and French Guinea. It is short, but has a wide estuary, on the S. bank of which stands the town and fort of Cacheo. Pop. about 15,000.

Cachet, LETTRES DE. See LETTRES DE CACHET.

Cachexia, a term usually applied to the general appearance, and especially the facial expression, which is characteristic of certain chronic diseases. The disease may exist without the cachexia, and the cachexia may be simulated in other diseases than that with which it is generally associated. The cancerous, the strumous, the syphilitic, and the malarial are examples of the better-marked cachexiæ, and are dealt with under the diseases to which they belong.

Cachoeira, tn., Bahia, Brazil, 52 m. N.W. of Bahia, on the Paraguassu R. Coffee and tobacco are the chief exports. Pop. about 15,000.

Cacholong, also called mother-of-pearl opal, and sometimes Kalmuck agate, a variety of opal, usually gray in color, milk white, or bluish white, and resembling mother-of-pearl. It is banded with layers of different colors, and makes a beautiful ornamental stone. It is found mostly in crevices in certain igneous rocks in Iceland, Faroe, and several places in Ireland, Carinthia, Nova Scotia, and elsewhere.

Cacique, or CAZIQUE, a title equivalent to prince or chief; confined to the native tribes of Hayti, Cuba, Mexico, Peru, and the west side of S. America.

Cacodæmon. See DEMONOLOGY.

Cacodyl, tetramethyl diarsine ($As_2(CH_3)_4$), is a compound prepared by heating cacodyl chloride with zinc. It is a colorless, ill-smelling liquid that is insoluble in water, and very easily catches fire in the air. It is also obtained mixed with cacodyl oxide by the distillation of arsenious anhydride with potassium acetate as a spontaneously inflammable liquid, known as 'alcarsin,' or 'Cadet's fuming liquid,' from which the chloride can be obtained by the action of hydrochloric acid. Cacodyl acts very like a simple metallic element, the group $As(CH_3)_2$ uniting with oxygen, sulphur, chlorine, etc., just like a metal. When acted on by mercuric oxide, cacodyl oxide yields cacodylic acid, As $(CH_3)_2O_2H$, a sour-tasting, odorless, crystalline solid, which with some of its salts, especially the cacodylates of sodium and of magnesium, has lately been much used in the treatment of skin diseases, being administered through the alimentary canal, or hypodermically. Sodium cacodylate contains about 55 per cent. of arsenic, and can be used with advantage in all diseases in which arsenic has proved useful, the union with the alkyl making it less toxic, and therefore endurable in larger quantities and for longer periods. It has been recommended in skin diseases, early tuberculosis, and some mental affections.

Cacomistle, a small animal (*Bassariscus astutus*) of Mexico and adjacent parts of the United States, which is allied to the raccoon, has similar but more active and nocturnal habits, and is often made a pet by the people of the region, where it is known to Americans as 'civet-cat.'

Cactus. With very few exceptions, the cacti, to the number of 1,000 species, are natives solely of America. They are succulent plants, with small, awl-shaped deciduous leaves, and stem-joints which are flat or cylindric, and often appear to be leaves. Vivid flowers and fruits are borne on these joints. They are usually armed with many spines. Their curious structure is specially adapted to arid plains and hillsides; their succulent stems are reservoirs for large quantities of water, and transpiration and evaporation are minimized by the small surface exposure in proportion to the total mass, and by the thick epidermis which covers the whole plant. These stores of water are often tapped by natives, and are occasionally utilized by cattle. The height of certain species is fifty feet or more, and the appearance of these prickly, almost leafless, roughly cylindrical masses, often with gaunt arms, is strangely grotesque. The prickly pear or Indian fig (*Opuntia*), is a member of this family. There are altogether some eighteen genera of cacti, those most familiar to horticulture being Mamillaria, Phyllocactus, Cereus, Opuntia, Epiphyllum, Echinopsis, and Echinocereus. Propagation is commonly effected by means of cuttings taken from the parent by means of a sharp knife and laid on a dry shelf till roots are formed. Cacti are not difficult to raise from seed, particularly in the case of the genera Cereus, Mamillaria, and Echinopsis. The flowers of most of the cacti are large and brilliant, and some, like those of the night-blooming cereus, are extremely fragrant and open nocturnally. When deprived of their thorns by burning, the opuntias form a succulent fodder; the same tribe have juicy fruits (the 'prickly pears,' or 'tuñas' of the West), which are not only a food about the Mediterranean, but part of the American Indian's diet also. The giant cereus (q.v.) is also valuable as a food. For a description of the Spineless Cactus, see BURBANK.

Barrel Cactus, Colorado Desert.

Cacus, a son of Vulcan, inhabited a cave in the Aventine Mount, one of the seven hills of Rome. When Hercules was returning with the oxen of Geryon, Cacus stole some of them, dragging them backward by their tails into his cave in order to elude pursuit. But Hercules heard their lowing, and after a struggle defeated and slew Cacus.

Cada Mosto, Alois, or Luigi da (1432–77), a Venetian who explored the west coast of Africa as far south as the Rio Grande, discovering (1457) Cape Verde Islands. His narrative has been translated into French, *Rélation des Voyages à la Côte, Occidentale d'Afrique d'A. de Cada Mosto* (1897).

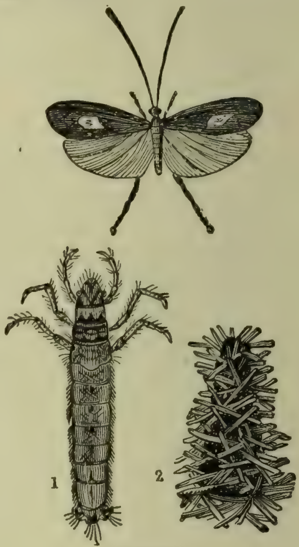
Caddis-flies, insects regarded as forming the order Trichoptera. The wings are more or less clothed with hair, and the posterior pair are larger than the anterior; the antennæ are thread-like; the mandibles are absent, and the metamorphosis is well marked, the larvæ ('caddis-worms') being caterpillar-like, and usually inhabiting cases which they have themselves constructed. Almost all small, of feeble flight, and inconspicuous in appearance, the perfect insects have always attracted much less attention than the larvæ, which are common in fresh water, and are often kept in aquaria. The eggs are surrounded by jelly and dropped into the water. Immediately after hatching, the larvæ begin to make cases by spinning together with silk minute stones, fragments of shell, grains of sand, twigs, pieces of water-weed, or any other material which may be at hand. The case in most species is open at each end, and from it the anterior end of the larva is protruded ready to catch the minute animals upon which it feeds. When larval life is over, the creature passes into the pupa stage within its case, which is at this time closed with silk. Within the case the nymph—a form strongly resembling the perfect insect—is developed. It possesses strong mandibles, and with these cuts through the case, and swims to some body such as a water-plant, by means of which it can climb from the water. The nymph-skin then bursts, and the imago emerges, and flies away to begin the short life of reproduction. See Needham, *Aquatic Insects of the Adirondacks* (1901); W. S. Furneaux's *Life in Ponds and Streams* (1896).

Cade, Jack (d. 1450), the leader of the Kentish insurgents of 1450, who were roused to arms by the fiscal exactions of the royal officials. The insurgents constituted a well-organized force, and utterly defeated the detachment of the royal army sent against them by the king (Henry VI.), who was obliged to retreat upon London, and, a few days later, to Kenilworth. Thereupon Cade took possession, on July 2, of London, where he was received favorably by the citizens. On the following day Cade ordered the arrest of Lord Say-and-Sele and his son-in-law, Crowmer, sheriff of Kent, who were regarded as the chief causes of the recent oppressive taxation. Both were beheaded, with little show of trial. The city now became alarmed at the excesses of the insurgents, between whom and the citizens a bloody struggle took place on the night of July 5. As a result of this, terms were arranged, and the Kentishmen retired from London. A reward being offered for the capture of Cade, he was taken prisoner on July 12, but died from wounds received in the struggle.

Cadell, Francis (1822–79), Australian explorer, was born at Cockenzie, Scotland; took part in the Chinese War of 1840–1, being present at the siege of Canton and the capture of Amoy and Ningpo. In 1848 he visited Australia, where a series of expeditions culminated in the successful navigation of the Murray, Edward, and Darling rivers. During a trading voyage to the Spice Islands he was murdered by his crew.

Cadell, Robert (1788–1849), Scottish publisher, born at Cockenzie, Scotland, became (1811) a partner in the house of Constable & Co., Edinburgh. After the bankruptcy of the firm in 1825, he was chosen by Scott as the sole publisher of his subsequent novels. In 1827 he began to issue the successful 'Author's Edition' of the Waverley Novels. See Lockhart's *Life of Scott* (1860).

Cadenabbia, vil. and health resort, Italy, on w. shore of Lake Como, nearly opposite Bellagio; is visited chiefly in spring and autumn. Here is the beautiful Villa Carlotta (1747), adorned with sculptures by Thorwaldsen and Canova.



Caddis-fly.
1, Larva; 2, case of larva.

Cadence, in music, is the name given to the closing—usually last two—chords of a phrase. The many varieties of cadence may all be classified as forms of perfect, imperfect, or interrupted cadences. The *perfect* must have its last chord on the tonic; when the penultimate chord is on the dominant, it is called an 'authentic'; when on the subdominant, a 'plagal' cadence. The harmony of the *imperfect* is often that of the dominant perfect reversed. The *interrupted* is a progression of chords leading the ear to expect a tonic chord, but another is substituted for the latter, and the effect is often as charming as it is unexpected.

Cadency, that department of heraldry which treats of the symbols (marks of cadency) borne on their shields by the younger members and branches of a family to distinguish their arms from those of the head of the house and of each other. See Heraldry.

Cadenus. See SWIFT, JONATHAN.

Cadenza, k*a*-den'*za*, in music, an ornamental passage introduced before the close of a section of a musical composition. At one time cadenzas were left to the improvisation of the performer, but now they are usually written out in full by the composer.

Cader Idris, kad'*e*r id'ris, a mountain ridge in Wales, in Merioneth; 4 miles southwest of Dolgelly. Its summit (2,929 feet), affording a beautiful view, is a favorite resort of tourists.

Cadet', originally a younger son; now a pupil in a military school, as the U. S. Military Academy (q.v.) at West Point. The term is sometimes applied, also, to young men in naval training, though students at the U. S. Naval Academy are now known as midshipmen, and to graduates of technical schools acting as engineering apprentices for various public utilities companies.

Cadi, kä'dē, or KADI, a judge of first instance under the Mohammedan system of law, possessing both civil and criminal jurisdiction. His powers under the latter branch include the infliction of the capital penalty. He has, further, various administrative functions; and being of necessity an ecclesiastic—for Mohammedan law is based upon the Koran—he sometimes performs purely religious duties. He must be a scholar of blameless life, conversant with all phases of the sacred law, and if appointed to office is bound to accept, regardless of his own wishes.

Cadillac, kad'i-lak, city, Michigan, county seat of Wexford county, on Lakes Cadillac and Mitchell, and on the Ann Arbor and the Pennsylvania Railroads; 98 miles north of Grand Rapids. It is located in a popular resort district and there are two State parks within the city limits. It is also an important lumber centre, crude lumber being manufactured into a wide variety of finished products. Industrial establishments include machine shops, iron plants, lumber mills, a motor truck plant, chemical works, and furniture and veneer factories. Cadillac was settled in 1871. Pop. (1910) 8,375; (1920) 9,750.

Cadiz, kad'iz; *Span.* kä'dēth, province, Southern Spain, one of the richest and busiest in the kingdom, including not only the great peninsular city of Cadiz, but also the important commercial centres of Jerez, San Lucar, Puerto de Santa Maria, and San Fernando; area 2,834 square miles. Wine, fruit, and fish are the chief natural products of the province. It furnishes practically the world's supply of sherry. Manufacturing is actively carried on. Pop. (1920) 547,827.

Cadiz, city, Spain, capital of the province of Cadiz, and one of the most important cities of the kingdom, is situated on a long narrow peninsula, projecting into the Atlantic; 95 miles southwest of Seville. The harbor is spacious and strongly fortified and contains the arsenal of San Fernando. The city is surrounded by walls and with its gleaming white buildings presents a striking appearance. The streets are narrow but well paved and well lighted, and the houses are mostly of the Moorish type, flat-roofed, surmounted by towers. Features of interest are the two cathedrals, one of the 16th and one of the 18th century; the Alameda de Apodaca, a beautiful promenade on the water front; the Parque Genoves; the church of Santa Catalina, containing Murillo's *Marriage of St. Catharine;* and the Academy of Fine Arts, with a good picture collection.

The commercial importance of the city has declined in the past few decades. There are shipbuilding yards and salt works, and sherry, olives, figs, and fruits are exported.

Cadiz was founded by the Phœnicians in 1100 B.C. It passed to the Carthaginians about 500 B.C. and was captured by the Romans after the Second Punic War, being known as Gades. In the fifth century it was occupied by the Goths, and in 1262 was taken by the Christians. Sir Francis Drake burned the shipping in the harbor in 1587, and in 1596 the city was sacked and ruined by Essex. In the eighteenth century a monopoly of Spanish-American trade brought great prosperity, but with the loss of the Spanish colonies in America this soon declined. It was here that the liberal constitution of 1812 (see SPAIN) was proclaimed. Pop. (1920) 76,718.

Cadiz, BATTLE OF. On July 21, 1640, at about fifteen leagues from Cadiz, a French squadron, under Armand de Brézé, defeated a Spanish convoy. In this action tactics much in advance of the time were made use of by De Brézé, who detached part of his force, under Rear-Admiral de Coupeauville, to leeward of the enemy, while he engaged him to windward, thus putting the Spaniards between two fires. The result was indecisive; but the Spaniards lost five vessels and about a thousand men, while the French loss was small.

Cadiz, BAY OF, an inlet of the Atlantic Ocean on the southern coast of Spain. It is divided into two parts; the larger and outer, with a breadth of 7 miles, is exposed to the southwest, and has on the north the town of Rota, and on the south Cadiz. At the northern extremity is La Carraca, noted for its arsenal and shipyards; on the island of Leon stands the observatory of San Fernando. Salt is obtained from the neighboring marshes.

Cad'man, CHARLES WAKEFIELD (1881–), American composer, was born in Johnstown, Pa., and received his musical education in Pittsburgh, where he studied harmony, orchestration, and the organ. He was for a time music critic on the Pittsburgh *Despatch* and was organist in various churches in Pittsburgh until 1910, when he removed to Los Angeles. He made a special study of American Indian music. In addition to piano pieces, chamber music, and orchestral selections, his works include *American Indian Songs; Idylls of the South Sea; The Sunset Trail; The Morning of the Year; The Garden of Mystery* (one-act opera); *Shanewis,* an opera based on an Indian theme, the first American opera to have been given two consecutive seasons at the Metropolitan Opera House, New York; *A Witch of Salem,* produced by the Chicago Civic Opera Company in 1926.

Cadman, S. PARKES (1864–), American clergyman, author, and lecturer, was born in Wellington, Shropshire, England. He was graduated from Richmond College (Wesleyan Methodist), London, and went to America, serving as pastor in Millbrook, N. Y. (1890–93), Yonkers, N. Y. (1893–5), and at the Metropolitan Temple, New York City (1895–1901), which he left to assume the pastorate of the Central Congregational Church, Brooklyn. He was lecturer on the Shepard, Carew, and Cole Foundations at Bangor, Hartford, and Vanderbilt University Theological Seminaries, and was a special delegate to the Tercentennial of the Mayflower, Plymouth, England, in 1920. He acquired wide popularity both as a lecturer and preacher. His published works include: *The Victory of Christmas; William Owen, a Biography; The Three Religious Leaders of Oxford; Charles Darwin and other English Thinkers* (1911); *The Religious Uses of Memory* (1912); *Ambassadors of God* (1920); *Christianity and the State* (Lectures at the Pacific School of Religion, Berkeley, Cal., 1922); *Imagination and Religion* (1926).

Cad'mium (Cd, 112.4), a metallic element, compounds of which occur in small quantities associated with zinc. It comes off earlier than zinc in the preparation of that metal by distillation, condensing as a brown oxide which can be reduced by distillation with charcoal. Cadmium is a soft, bluish-white metal, malleable and ductile. Its specific gravity is 8.6; it melts at 320° C., and boils at 778° C. It tarnishes slightly in air, and burns when heated in it, forming a brown oxide. It forms a series of salts, of which cadmium sulphate, $CdSO_4$, a white, crystalline, soluble solid, is typical, and which are characterized by forming a bright yellow sulphide on addition of hydrogen sulphide. Cadmium is a component of easily fusible alloys, and is alloyed with silver in electroplating; cadmium sulphide is used as a pigment, different shades being produced by altering the acidity of the solution from which it is precipitated.

Cad'mus, son of Agenor, king of Phœnicia, and brother of Europa, who was carried away by Jupiter disguised as a bull. At the command of his father, Cadmus undertook a search for his sister. Failing in this, he consulted the oracle of Apollo, which bade him give up his efforts, follow a cow which he would find in a field, and found a city where the animal should lie down. He obeyed, and eventually came to Bœotia, where he established the city of Thebes. Upon his arrival, wishing to sacrifice to Jupiter, he sent his servants to seek pure water, but though they found a gushing fountain, they were all slain by the dragon who guarded it. Cadmus thereupon slew the dragon and sowed its teeth, which sprang up as armed men; a conflict ensued and only five survived, from which the Thebans claimed descent. Cadmus wedded Harmonia, and with his wife was changed into a serpent by Zeus, and removed to Elysium. He is said to have introduced the alphabet into Greece, a legend which would indicate that the ancient Greeks traced the art of writing to the Phœnicians, a theory which is still accepted.

Cadogan, ka-dug'an, GEORGE HENRY CADOGAN, FIFTH EARL (1840–1915), British statesman, was born in Durham, and educated at Oxford. He was under-secretary of war (1875–8); under-secretary for the colonies (1878–80); Lord Privy Seal (1886–95); and lord-lieutenant of Ireland (1895–1902).

Cadomum. See CAEN.

Cadorna, kä-dor'nä, COUNT LUIGI (1850–), Italian general, was born in Pallanza. He entered the army in 1866 and became chief of the general staff in 1914. On Italy's entrance into the Great War, he was made commander-in-chief of the Italian armies in the field. He was transferred, after the Italian disaster at Caporetto, in October 1917, to the Allied War Council at Versailles and in 1918 was retired from the army. Although General Cadorna's military policy was the subject of adverse criticism, he is regarded by many as having showed great strategic skill and is counted among the foremost of Italy's military men. He published *La guerra alle fronte italiana* in defense of his leadership.

Died Dec 21, 1928

Cadoudal, kȧ-dōō-dȧl', GEORGES (1771–1804), French royalist leader, the most brilliant figure in the Chouan War, was born near Auray, in Lower Brittany, the son of a peasant proprietor. On the breaking out of the royalist insurrection in La Vendée, he joined the Vendéan army (1793) and during the next six years carried on a determined and vigorous resistance to the forces of the republic. His arrest for conspiracy against Napoleon, at Paris, on March 9, 1804, was followed by his execution on June 25.

Cadoxton, ka-duks'tun, town, Wales, in Glamorganshire; 7 miles southwest of Cardiff. It has coal mines and tin-plate works. Pop. 20,000.

Caduceus, ka-dū'si-us, originally an enchanter's wand, and later a herald's staff, is most familiar in the hands of Hermes. Its first form was three shoots, of which two were intertwined, while the third formed the handle. The fully developed form has, besides the rod itself, a pair of wings either at the top or in the middle, and two serpents intertwined.

Mercury and Caduceus

Ca'dy, J. CLEVELAND (1837–1919), American architect, was born in Providence, R. I. He was educated in Plainfield Academy and at Trinity College, Hartford, and in 1870 began the practice of architecture. He designed the Brooklyn Art Association building, several buildings for Yale University, Williams, Wesleyan, and Trinity Colleges, and various commercial buildings and homes in different parts of the United States.

Cadzow. See HAMILTON.

Cæcilius Statius, sē-sil'i-us stā'shi-us, a Roman comic poet, a native of Milan, and originally a slave. He was the immediate predecessor of Terence, dying in 168 B.C. As a writer he is classed with Plautus and Terence. Only a few fragments of his plays survive.

Cæcum, sē'kum (Lat. 'blind'), a dilatation, about 2½ inches long, at the junction of the small and large intestines. It communicates with the small intestine by means of the ileocecal valve, and the vermiform appendix is attached to it by the so-called meso-appendix (for illustration see INTESTINES). The cæcum is sometimes the seat of inflammation—typhlitis, perityphlitis. See also APPENDIX.

Cædmon, kad'mon, English poet of the seventh century, about whose life little is known. He was a servant of the monastery at Whitby, and well on in years, according to Bede's *Ecclesiastical History*, when he had a vision in which a heavenly visitant commanded him to sing 'the beginning of created things.' Bede continues that he sang all the principal events in sacred history, from the creation to the day of doom.

There are extant two series of poems which correspond closely with several of the subjects said by Bede to have been sung by Cædmon: the first, *Genesis, Exodus*, and *Daniel;* the second, *Fallen Angels*, the *Harrowing of Hell*, and *Temptation*, collectively *Christ and Satan*. The second series, however, is probably of too late date to be by Cædmon, and even the first series may have been written in part or in whole by his successors or disciples. A Cædmon memorial cross was erected at Whitby in 1898.

The only complete text of the 'Cædmonian poems' is in Grein and Wülker's *Bibliothek der angelsächsischen Poesie* (1883). The only complete translation is Thorpe's *Cædmon's Metrical Paraphrase* (1832). Consult Wülker's *Grundriss zur Geschichte der Angelsächsischen Literatur* and Brooke's *English Literature from the Beginning to the Norman Conquest*.

Caen, kän (anc. *Cadomum*), city, France, capital of the department of Calvados, on the river Orne, about 10 miles from its mouth; 124 miles northwest of Paris. It is a famous centre for the study of Norman art, having two of the finest Romanesque churches in France: St. Etienne's, containing the tomb of William the Conqueror, now empty, and La Trinité, founded in 1062 by Matilda as a nunnery for noble dames, and containing her tomb. Other features of interest are the university, the church of St. Pierre, and the Musée, housed in the Hôtel de Ville. Caen is an important commercial city and has large exports of iron and building stone (Caen stone). It manufactures lace, cotton, oil, and chemicals. It was the favorite residence of William the Conqueror. In 1417 it was captured by Henry V. and remained in English hands until 1450. Pop. (1920) 53,743.

Cære, se′rē, ancient Etruscan city, 20 miles northwest of Rome. When Rome was captured by the Gauls, many Romans sought refuge at Cære. See Cervetri.

Caerlaverock. See Carlaverock.

Caerleon, kär-lē′un, town, England, in Monmouthshire, on the river Usk; 2½ miles northeast of Newport. Under the Romans it was called *Isca Silurum*, and was the capital of Britannia Secunda (Wales). Numerous Roman remains have been found here, including walls, baths, an amphitheatre (16 feet high, and 222 by 192 feet), and a large mound known as King Arthur's Round Table. Geoffrey of Monmouth connects the place with King Arthur. Pop. (1921) 2,285.

Caermarthen. See Carmarthen.

Cæsalpinia, ses-al-pin′i-*a*, a genus of beautiful tropical leguminous trees and shrubs of some economic importance by reason of the tanning material and dyes obtained from them. There are some thirty species, chief among which are *C. pulcherrima*, known also as 'Barbados pride,' 'flower fence,' and 'dwarf poinciana,' a beautiful evergreen shrub with brilliant, red or yellow flowers; *C. japonica*, with yellow flowers and red stamens, a hardy species which can be grown out of doors in the Southern States; *C. sappan*, an Asiatic tree valued for its wood; *C. coriaria*, the pods of which are known as divi-divi (q.v.). They are all easy to propagate by seeds, which should be soaked in warm water twelve hours before being sown.

Cæsalpinus, ses-al-pī′nus, Andreas (1519–1603), Italian botanist, was born in Arezzo, and became professor of botany at Pisa. He was one of the first to attempt a comprehensive classification of plants upon a natural system, and Linnæus made considerable use of his *De Plantis Libri XVI.* (1583–1603) in framing his artificial system.

Cæ′sar, the cognomen of a famous Roman family of the Julian clan. It was of patrician rank, and claimed to trace its descent back to Iulus, the son of Æneas. Augustus (q.v.) took the name as the adopted son of Julius Cæsar (q.v.), and from him it passed to Tiberius, Caligula, Claudius, and Nero, who were all by descent or adoption connected with the family. Later emperors also used the title, prefixing it to their own names—*e.g.*, Imperator Cæsar Domitianus Augustus. When Hadrian adopted Ælius Verus, he allowed him to take the name of Cæsar; and thenceforward it was borne by the intended successor to the imperial throne, the reigning emperor reserving the designation 'Augustus' for himself. The following members of the family are also worthy of note:

(1) Lucius Julius Caesar was consul in 90 B.C., in which year he passed a law which granted Roman citizenship to all the allies who had not openly taken up arms against Rome (*Lex Julia de Civitate*). He was censor in 89 B.C., and, being a member of the aristocratic party, fell in the massacres under Marius in 87 B.C.

(2) Gaius Julius Cæsar, Strabo Vopiscus, brother of the above, was curule ædile in 90 B.C. With his brother, he was murdered in 87. He was famous as an orator and a poet, and as such Cicero introduces him as a character in the *De Oratore.*

(3) Lucius Julius Cæsar, son of (1), was consul in 64 B.C., and in 52 was one of Cæsar's legates in Gaul. Though originally of the aristocratic party, he attached himself to Cæsar, and accompanied him to Italy at the outbreak of civil war. In 47, during Antony's absence, he was prefect of the city of Rome. After Cæsar's death he joined the senatorial party against Antony, who for this reason put him on the list of the proscribed in 43. He was saved by the intercession of his sister Julia, the mother of Antony.

(4) Lucius Julius Cæsar, son of (3), joined Pompey in the civil war, and in 49 B.C. was sent to Cæsar with peace proposals. In 46 he served under Cato at Utica, and after the latter's death advised the inhabitants to surrender. He was murdered by Cæsar's troops.

Cæsar, Gaius Julius (102–44 B.C.), the great Roman dictator, was born on July 12, probably in the year 102 B.C., though the year is usually given as 100 B.C. He was made priest of Jupiter in 87 B.C., by Marius, the husband of his aunt, Julia; and this connection with the head of the popular party marked him out as a leader of the people, a position which was strengthened by his marriage (83 B.C.) with Cornelia, daughter of Cinna, Marius' successor in the popular leadership. When Sulla returned from Asia, and became omnipotent at Rome, he ordered Cæsar to divorce Cornelia. Cæsar, however, refused to obey, was proscribed, and forced to conceal himself in the Sabine country. In 81 B.C., having been pardoned, he went to Asia, where he served with distinction in the Roman army. Returning to Rome after Sulla's death, he distinguished himself in 77 by his prosecution of Cnæus Dolabella for extortion in Macedonia. Subsequently he retired to Rhodes, and on his return to Rome in 74 or 73, supported a popular measure brought forward by Aurelius Cotta, which deprived the senators of the exclusive control of the jury courts. In 68 he obtained the quæstorship; in 65 the ædileship, in which office he spent enormous sums on public games and buildings; and in 63 was elected pontifex maximus, the chief priest of Rome.

In 68 Cornelia died, and in 67 Cæsar married Pompeia, daughter of Q. Pompeius Rufus and granddaughter of Sulla, further proving his attachment to the Pompeian house by supporting the Gabinian and Manilian laws, which conferred extraordinary power on Pompey.

He was prætor in 62, and in the next year went as proprætor to Farther Spain. This enabled him to pay his debts, and to gain some military reputation by victories over the Lusitanians. He was elected consul for 59 B.C., and in that year formed with Pompey and Crassus the first triumvirate. In spite of the opposition of his colleague in the consulship, Bibulus, a thorough aristocrat, he put through an agrarian law; he also obtained easier terms for the knights in regard to the farming of the taxes of Asia, and the ratification of Pompey's actions in the East. For himself, overriding an arrangement made by the senate, he obtained the province of Cisalpine Gaul and Illyricum for five years, to which the senate added Transalpine Gaul.

At about this time Pompey married Cæsar's daughter Julia, and Cæsar married Calpurnia, having divorced Pompeia in 62 on account of the scandal connected with Clodius' desecration of the mysteries held in his house as prætor.

In 58 he went to his province, where he remained for nine years, during which time he subdued the whole of Transalpine Gaul, conquering the Helvetii, the Germans led by Ariovistus (58), the Belgian tribes (57), the Veneti and other tribes on the west coast (56), and the invading German tribes, the Usipetes and Tencteri (55). In 55 he invaded Britain for the first time, but returned after effecting a landing and demanding hostages from the tribes which resisted. The following year he again crossed the channel and forced Cassivelaunus, king of the Trinobantes, to pay tribute to Rome.

In 55 a new arrangement with Pompey and Crassus had secured for Cæsar the extension of his command for five more years—from Jan. 1, 53, to Dec. 30, 49. But Pompey was growing jealous; the death of his wife Julia in 54 dissolved one of the few ties between the two leaders; and the death of Crassus at Carrhæ in 53 left them without a mediator. Pompey, therefore, joined the aristocratic party, and after being sole consul in 52 B.C., secured the government of Spain for five years. Cæsar, determined to obtain a position at least equal to Pompey's, demanded election as consul for the year 48 in absence, while he still held power as governor of Gaul. This, however, was opposed by the senate, and in consequence Cæsar crossed the Rubicon, on or about Jan. 12, 49, with the words, *Iacta est alea* ('The die is cast'). Pompey's troops flocked to his command; he was welcomed everywhere; and after pursuing Pompey and his adherents to Brundusium, whence they sailed to Greece, he set out for Spain, where he defeated Pompey's armies. Returning to Rome, where he had been appointed dictator, he held the consular elections and was himself elected consul for 48. In that year he crossed to Greece, and after some fighting near Dyrrhachium, in which he was worsted, routed Pompey's forces near Pharsalus, in Thessaly, on August 9. Pompey fled to Egypt, but was murdered before Cæsar reached there.

Upon Cæsar's arrival in Egypt he became involved in a war against the guardians of the young king, Ptolemy, in behalf of the rights of the latter's sister Cleopatra. This war was brought to a close in March, 47, and Cæsar next marched through Syria and Asia Minor, defeating Pharnaces, son of Mithridates the Great, who was an ally of Pompey's, at the battle of Zela. The ease with which this battle was won inspired the great commander's famous despatch to the senate, *Veni, vidi, vici* ('I came, I saw, I conquered'). He reached Rome in September, 47; sailed before the end of the month to Africa, and on April 6, 46, defeated the Pompeians, under Scipio and Cato, at Thapsus. He now returned to Rome, undisputed master of the Roman world. He was at once appointed dictator for ten years, and the following year was made perpetual dictator; in 44, at the festival of the Lupercalia, Antony offered him the kingly diadem, but he refused.

Meanwhile Pompey's sons, Gneius and Sextus, had collected fresh forces in Spain. Advancing to meet them, Cæsar had routed them at Munda, not far from Cordova, on March 17, 45. But his power and influence had made him an object of jealousy and suspicion, and already the conspiracy against his life had been formed. Cassius was ringleader, and Marcus and Decimus Brutus, Casca, and sixty others were implicated. Although Cæsar received many warnings, he neglected them all, and met his fate in the senate house on the Ides (15th) of March, 44. Casca struck the first blow. Cæsar resisted, until Marcus Brutus also smote him; then, with the words, *Et tu, Brute!* ('Even thou, Brutus!') he fell.

Cæsar's reforms aimed at making all the provincial governors, military commanders, and even the magistrates of Rome, responsible to his central authority. He had not time to do much for the provincials himself, but it is clear that Augustus and his successors simply followed the lines which he had laid down. His domestic policy tended to free the people from the unconstitutional dominion of the senate.

Cæsar's honesty, his patriotism, his devotion to the welfare of the poorer classes and the provincials, his unprecedented moderation toward his opponents, his extraordinary power of work, his statesmanship, and his eloquence are testified to by both his friends and enemies. His military genius is proved by an exact study of his campaigns, and has been admitted by the greatest critics of modern times. In private life he was affable, witty, generous, and devoted to his mother, his successive wives, and his friends. He had his share of weaknesses: he was ashamed of being bald, and valued highly the privilege accorded him of wearing a laurel wreath, which concealed his lack of hair. As an author, he was placed in the highest rank by his contemporaries. He was particularly noted for the purity of his style, and published a careful study of the Latin language, which, however, has been lost. His only extant work is the *Commentaries*, or *Diary of the War in Gaul* (the books on the civil and African war usually attached to it are not his). Editions of the *Commentaries* are innumerable; those of Mensel (1894), Rheinhard and Herzog (1892), Peskett, Allen and Greenough (1886), Benoist and Dosson (1892), are all standard.

Consult also Mommsen's *History of Rome;* S. J. Delorme's *Cæsar et ses contemporains; Lives* by Napoleon III., Froude, and Fowler; Baring-Gould's *Tragedy of the Cæsars;* Holmes' *Cæsar's Conquest of Gaul.*

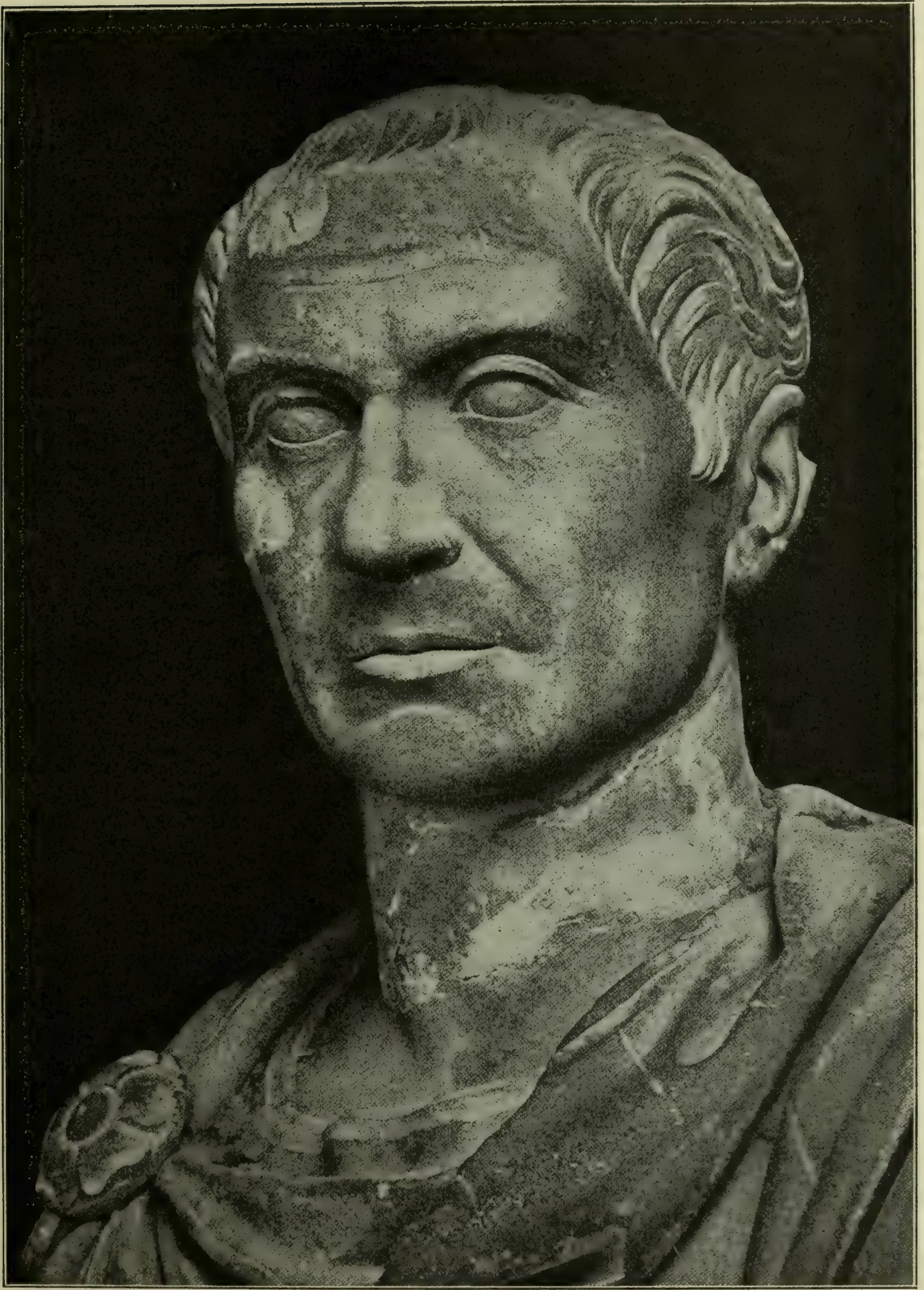
Cæsarea, ses-*a*-rē'*a*, or sez-*a*-rē'*a*, now Kaisarieh, a name given to several ancient cities. (1) Cæsarea ad Argæum, formerly Mazaca, was given the name when Cappadocia became a Roman province, in 18 A.D. It was destroyed by an earthquake. (2) Cæsarea Philippi, or Paneas, now Banias, a city in Palestine, below Mt. Hermon, on the Jordan, was founded by Philip the Tetrarch in 3 B.C. It was here that Jesus questioned his disciples: 'Who say ye that I am'? and that Peter made his great confession (Matt. xvi. 13–20). (3) Cæsarea Palæstinæ, on the borders of Samaria and Galilee, was named in honor of Augustus by Herod the Great (13 B.C.), who also fortified and adorned it. Here Peter preached to Cornelius the centurion (Acts x.) and here Paul was imprisoned.

Cæsarean Section, sē-zā'ri-*a*n, the procedure for delivery of the fetus by means of an incision through the abdominal and uterine walls instead of by the natural route. It is indicated in marked cases of pelvic contraction and certain other conditions which render normal delivery impossible. The operation is an exceedingly ancient one, taking its name from Julius Cæsar, who is said to have been thus born. It was formerly performed only upon women who had just died or whose death was imminent, solely in the interests of the child. The first operation upon a living woman was done in 1491. The maternal death rate under favorable conditions is not high.

Cæsena. See Cesena.

Cæsium, sē'zi-um (Cs, 133), an alkaline metal discovered by Bunsen in 1860, by spectral analysis, in the mineral water of Dürkheim, in the Palatinate. It occurs also in a rare mineral pollux, and is best isolated by the electrolysis of its fused cyanide. Cæsium is a soft metal closely resembling potassium, and is characterized by a spectrum containing two bright blue lines, along with others in the red, yellow, and green.

Cæsura, se-zū'r*a*, a metrical pause in the middle of a line of verse, generally defined as the point at which a reader would pause to gather breath; and while it may also coincide with a grammatical pause, it need not do so. There may be more than one cæsura in a line; on the other hand, verses shorter than the decasyllable need have none at all. The cæsura most commonly occurs in English heroic measure after the fourth or sixth foot;



GAIUS JULIUS CÆSAR

but the most subtle effects are produced by a studied variety of usage. See BLANK VERSE.

Café. See RESTAURANT.

Caffeine, THEINE or METHYL-THEOBROMINE ($C_8H_{10}N_4O_2$), an alkaloid which forms the stimulating principle in coffee (where it amounts to 1.5 per cent.), in tea (where it forms 2 to 4 per cent.), in the S. American *maté* (an infusion of the leaves of *Ilex paraguayensis*), and in the kola nut of Africa. It crystallizes in long, silky, colorless needles, and dissolves very slightly in cold water, but readily in hot water or alcohol. It is obtained from a strong infusion of boiled tea, from which the tannin is precipitated by excess of lead acetate; it is then filtered, the excess of lead is thrown down by hydrogen sulphide; this is again filtered, the liquid is evaporated down, and neutralized by potassium hydroxide when the caffeine crystallizes out. It is used medicinally in very small doses as a heart stimulant. In larger doses it makes the heart's action irregular, and in lethal doses causes narcotism, and arrests the heart. Habit weakens the effect of both tea and coffee on the nervous system. Caffeine is also a diuretic, acting much more markedly on some individuals than on others. Both on account of its action on the heart and blood-vessels, and also because of its stimulating action on the kidney cells, it is used in dropsy; it has been recommended for pneumonia, and its action on the brain is taken advantage of in cases of migraine. It is often of great value in counteracting the effect of poisonous doses of opium, alcohol, or other narcotics.

Caffraria. See KAFFIRS.

Cagayan. (1.) Prov., Luzon, Philippines, N.E. corner of the isl., bounded on the S. and W. by Isabela, Lepanto-Bontoc, Abra and Ilocos Norte. Area, with dependent isls., 5,291 sq. m. Its mountains represent three systems, the Grande Oriental, the Norte and the Central. The highest peak is Pacsan, 7,330 ft., on the W. border. The Rio Grande de Cagayan, the largest river of Luzon, flows through one of the most promising regions of the archipelago. The province is scarcely rivalled in the production of tobacco, and the fertility of the soil is such that sometimes one piece of land will yield in addition to the regular staple two crops of corn in a twelvemonth. The bulk of the foodstuffs is generally imported. Tuguegarao, the capital, is 211 m. N. by E. of Manila. Pop. (1903) civilized, 142,825; wild, 13,414. (2.) C. DE MISAMIS, pueb. Mindanao, Philippines, cap. of Misamis prov., 2½ m. from the coast, on riv. of same name. A lively traffic with neighboring coasts is carried on by native boats. The anchorage is exposed on the N.W. Gold is found in the region. Pop. (1903) 7,108. (3.) C. DE SULU, or JOLO, an isl., and group with its dependent isls., in the Sulu Sea off the coast of Borneo, about half-way between Palawan and the Sulu Is. Area, 43 sq. m.; group, 46½. Of the usual volcanic and coral formation, and with an exceptionally wet climate, they have many features of scientific interest as well as striking scenic beauty. The large island has three wooded peaks, highest alt. 1,105 ft., and contains two circular lakes separated by a narrow dike, one of which is fresh water, but the other is connected with the sea. Hemp-palm, tobacco, sugar cane, yams, bananas, fruit and vegetables are raised, but fishing and cocoanut gathering are the chief occupations. Distance from Manila, 540 m. Pop. (1903), all wild, 2,000.

Cage-birds are birds kept in confinement for the sake of their beautiful plumage, their agreeable song, their lively disposition, or for the interesting study of their habits. The favorite cage-birds are the songsters. Among birds remarkable for the beauty of their plumage are the parrots, parrakeets, and cockatoos. The hardiest talking parrot is the yellow-faced Amazon, the well-known African gray being exceedingly difficult to acclimatize in northern countries. The cockatoos, though very showy birds, are noisy, and do not make good talkers. Far less attention is given to catching and caging native birds in America than in Europe, the mocking-bird and redbird (or Virginia nightingale) being those most often seen. The bird-stores are supplied, therefore, almost wholly with foreign songsters, mostly European and African finches, thrushes, starlings and larks. The canary (q.v.) is a cosmopolitan favorite.

The maladies of cage-birds are mostly due to overfeeding, unsuitable food, and want of exercise. For ordinary ailments a drop of castor oil, administered on the point of a quill, is generally efficacious. As most birds are very delicate, they should never be allowed to remain in a draught. It is equally bad to expose them unprotected to the rays of the sun, or to keep them in an overheated room. Moulting is a critical period for all birds. At such times great care is necessary; stimulating food should be given, and a rusty nail in the drinking water is a good tonic.

Important books are Bechstein's *Cage and Chamber Birds* (1864), Greene's *Notes on Cage-Birds* (1899), and Holden's *Book of Birds* (1897).

Cagli, tn. and episc. see of Italy, prov. Pesaro and Urbino, 13 m. S. of Urbino. Pop. (1901) 18,244.

Cagliari. See VERONESE, PAOLO.

Cagliari. (1.) Province of Italy (area, 5,184 sq. m.; pop. [1901] 483,548), coincident with the S. half of the island of Sardinia. (2.) Tn., and cap. of prov. of Sardinia, on S. coast, at the head of the gulf of the same name. Among the more important buildings are the citadel (13th century), the university (1596), the cathedral (14th century). The town also possesses a Roman amphitheatre, and Carthaginian-Roman necropolis. The harbor, naturally good, has been improved by the construction of two breakwaters. Cotton, woollens, biscuits, soap, and salt are the principal products of the industry; large quantities of wine are made in the vicinity. Pop. (1901) 53,057.

Cagliostro, ALNESSADRO, COUNT (1743–95), an *alias* of Giuseppe (son of Pietro) Balsamo, was born at Palermo. After a wild youth he left Palermo, and in company with Althotas, a Greek chemist, travelled through the Archipelago, till the latter died at Rhodes. From Turkey, Persia, Arabia (where he was entertained at Mecca and Medina as a man of repute), he returned with money (1773), and married the beautiful Lorenza Feliciana, with whom he resumed his travels and adventures. At Strassburg (1780) he gained notoriety by his cures, and by vending the 'elixir of life.' In London he established a cult of freemasonry (Egyptian), but had to flee to Paris. Here he revived his Egyptian cult, adding the lodge 'Isis.' Intimate with Cardinal de Rohan, and implicated in the affair of the diamond necklace, he was put in the Bastille, and then exiled. In St. Petersburg his frauds were detected by Rogerson, the Annandale physician; at Basel he was visited by Lavater (see Mirabeau's *Letters on Cagliostro and Lavater*, 1786). Venturing to Rome (1789), he was tried (1790) for freemasonry and sorcery, and imprisoned first at San Angelo, then at San Leone, in the duchy of Urbino, where he died. His *Life*, compiled from his trial, was published at Rome (1791). Goethe saw him, and wrote a play (*The Grand Cophte*) on his life; Dumas *père*, in his *Mémoires d'un Médecin* and Carlyle, in his *Cagliostro and the Diamond Necklace*, have treated the theme.

Cagnola, LUIGI, MARQUIS (1762–1833), Italian architect.

born at Milan. His works include the magnificent triumphal arch, Arco della Pace (begun in 1807 and finished about 1837, of white marble), the chapel of St. Marcellina in the church of Sant' Ambrogio, and the Porta di Marengo, all at Milan. He also built the campanile at Urgano, near Bergamo.

Cagots, the French name (Sp. Agots) for an outcast people in the Western Pyrenees. From the accounts cited by De Rochas, it seems clear that leprosy was originally one of the causes of their proscription. The descendants of the Cagots appear to have thrown off all hereditary disease, and to present no marked physical differences from the neighboring population, unless in the fact that fair hair and blue eyes are common among them—a fact sometimes cited in support of the belief that they are descended from the Visigoths. Certain references, identifying them with the Albigenses, Christians, and *Bons-hommes*, suggest that their religious belief was the chief cause of the persecution which they suffered; and it is noteworthy that *cagot* implies 'bigot.' There is no evidence that they ever used a separate language. The etymological question is specially dealt with by Michel in his *Histoire des Races Maudites de France et d'Espagne* (1846). See also De Rochas, *Les Parias* (1876); Webster, *Bulletin de la Société Ramon* (1867); Tuke, *Jour. Anthrop. Inst.* (1880).

Caguas, tn., Guayama, Porto Rico, 18 m. S.S.E. of San Juan, on the road to Ponce. Hot springs are found in the region and sedimentary rock, including marble and limestone. Manufacture of tobacco is the chief industry. Pop. (1910) 10,354.

Cahors (anc. *Divona*), cap. of dep. Lot, France, on a rocky peninsula on the r. bk. of the Lot, 60 m. N. of Toulouse. It is an episcopal see, with a Romano-Byzantine cathedral and the palace of Pope John XXII. (1316–34), who was a native, and founded (1331) the university (closed 1751). Textiles, earthenware, malt liquors, dyestuffs, and shoes are manufactured, and corn, wine, brandy and fruits are exported. Clément Marot was born here in 1495, and Gambetta (bronze statue) in 1838. Pop. (1901) 14,018.

Caibarien, seapt., Santa Clara prov., Cuba, 190 m. E. by S. of Havana. As the port of Remedios, 5 m. distant, it assumes some importance. Sponge-fishing and the sugar trade are the chief industries. Pop. (1899) 7,013.

Caïcos and **Turk's Islands,** isls. S. of Bahamas, W. Indies, are under the government of Jamaica; consist of more than thirty small cays, of which only eight are inhabited. The largest are North, East, and Grand, the last being the seat of government. Turk's Island is included with Caïcos. The total area is 165½ sq. m. The most important industry is salt-making ($110,868 exported in 1901). There are also a sponge industry and an export of turtle-shell. Sisal hemp is cultivated on W. Caïcos. Climate healthy, but enervating to Europeans. Pop. (1901) 5,350.

Cailliaud, FRÉDÉRIC (1787–1869), French explorer, was born at Nantes. During an expedition to Egypt in 1815 he succeeded in locating the ancient emerald mines of Jebel Zubara, and made other important archæological discoveries in the oases of Siwah. See his *Voyage à Méroê au Fleuve Blanc*, etc. (1826–7), *Voyage à l'Oasis de Syouah* (1823), and *Recherches sur les Arts et des Anciens Peuples de l'Egypte, de la Nubie e de l'Ethiopie* (1831–7).

Caiman, a name given to five species of alligator found in Central and S. America, which differ in minor points from the alligators of the coast of the Gulf of Mexico, but little in habits. See ALLIGATOR.

Cain (Heb. 'acquisition'), the first-born of Adam and Eve. He became a husbandman, and slew his shepherd brother Abel. In the land of Noe, Cain founded the first city, and there is a Jewish tradition that he was accidentally slain by his descendant Lamech. See C. F. A. Dillmann's *Genesis* (1881; trans. by W. B. Stevenson, 1897), on ch. 4; and CAINITES.

Caine, THOMAS HENRY HALL (1853), novelist and dramatist, was born at Runcorn, Cheshire, but his early years were spent in the Isle of Man. He is a very successful and prolific writer, his works including *Sonnets of Three Centuries*, *Recollections of Rossetti* (1881), *Life of Coleridge*, *Cobwebs of Criticism*, and the novels *The Shadow of a Crime* (1885), *A Son of Hagar* (1887), *The Deemster* (1887; dramatized as *Ben-my-Chree*), *The Bondman* (1890), *The Scapegoat* (1891), *The Little Manx Nation* (1891), *Capt'n Davy's Honeymoon* (1892), *The Manxman*, *The Christian*, *The Eternal City* (1901), and *The Prodigal Son* (1904), *The Manxman*, *The Christian*, and *The Eternal City* have also been dramatized and produced in various cities in the U. S. *The Prodigal Son* was presented in New York in 1906. Mr. Caine went to Canada to negotiate terms with the Dominion government with regard to Canadian copyright, and drafted a bill on the subject. He also visited the U. S. in 1895–96. See Kenyon's *Hall Caine: the Man and the Novelist* (1901).

Ca'ing Whale, PILOT WHALE, or BLACKFISH (*Globiocephalus melas*), a cetacean about twenty feet in length, common in the N. Atlantic, and perhaps identical with similar cetaceans of southern seas. It is met with in large herds or 'schools,' does not display great ferocity, and lives chiefly on cuttle-fish. The color is an almost uniform black, and there are small conical teeth in each half of the upper and under jaws. It yields a considerable quantity of oil, and the flesh and blubber are eaten in Scotland, both fresh and salted. The name is Scottish, and is derived from the fact that these whales can be 'ca'd' or driven like herds of cattle.

Ca'ing Whale, or Pilot Whale.

Cainites, a Gnostic sect, agreeing generally with the Ophites. Their distinctive feature seems to have been their approbation of the black sheep of Scripture—*e.g.* Cain, Esau, Korah, the Sodomites, and even Judas Iscariot, whom they held to have possessed an enlightenment and spirituality higher than those of their respective antagonists.

Ça ira ('It will go on'), a popular French song of 1789. The words were by Ladré, a street singer; the air was by Bécourt, an obscure musician. The refrain became the party cry of the revolutionists, and was prohibited by the Directory in 1797.

Caird, EDWARD (1835), Scottish philosopher, was born at Greenock; was fellow and tutor of Merton College, Oxford, from 1864 to 1866; professor of moral philosophy at Glasgow University from 1866 to 1893, and master of Balliol from 1893 to 1906. In 1891–2 he was Gifford lecturer at St. Andrews, receiving the corresponding appointment at Glasgow in 1900. His published works include *Critical Account of the Philosophy of Kant* (1877); *Hegel* (1882); *Religion and Social Philosophy of Comte* (1885); *Critical Philosophy of Immanuel Kant* (1889); *Essays on Literature and Philosophy* (1893); *The Evolution of Religion* (1893); *Essays on Literature* (1909).

Caird, John (1820–98), Scottish theologian, was born in Greenock. He was educated at the University of Glasgow and was successively minister of Newton-on-Ayr (1845–7), of Lady Yester's, Edinburgh (1847–9), and of Errol, Perthshire (1849–57). In 1855 he preached before Queen Victoria the famous sermon 'Religion in Common Life,' which gave him a world-wide reputation. He was minister of Park Church, Glasgow (1857–62), and in 1862 became professor of theology in the university, and in 1873 its principal. In 1890 his university made him its Gifford lecturer. His published works include *Introduction to the Philosophy of Religion* (1880; 2d ed. 1900); *Spinoza* in Blackwood's 'Philosophical Classics' (1888); *University Addresses* (1899); *University Sermons* (1873–98). Caird's Gifford lectures, edited with a Memoir by his brother, master of Balliol, were published in 1900 as *The Fundamental Ideas of Christianity* (2 vols.).

Cairn, kârn or kärn, in archæology, a mound of stones raised over prehistoric interments, particularly common in Scotland and Wales, and akin to the English barrow (q.v.). Ancient cairns are of two types—chambered, belonging to the stone age, and unchambered, of the bronze age. The chambered cairns are of two types, long cairns and horned cairns. The latter are found over the British Isles, but the former exclusively in the northeast of Scotland. The essential constructive features of these stone-age cairns are a definite ground plan, and a passage leading from the bounding stones to the central enclosure of chambered tombs, megalithic in character, and implying family or tribal sepulture. Consult Anderson's *Scotland in Pagan Times: the Bronze and Stone Ages.*

Cairnes, kârnz *or* kärnz, John Elliott (1823–75), Irish political economist, was born in Castle Bellingham, County Louth. He was graduated from Trinity College, Dublin, and in 1856 won by competitive examination the Whately professorship of political economy at that institution. In 1859 he was appointed professor of political economy and jurisprudence in Queen's College, Galway, and in 1866 became professor of political economy in University College, London. His last years were ones of invalidism, although marked by great intellectual vigor. His published works include *The Character and Logical Method of Political Economy* (1857), his first course of professorial lectures; *The Slave Power* (1862), a masterly defence of the North in the American Civil War; *Political Economy* (1873); *Leading Principles of Political Economy, Newly Explained* (1874). Cairnes, although in the main a follower of John Stuart Mill, was, nevertheless, an original thinker and one of the foremost economists of his day.

Cairngorm, kârn *or* kärn'gorm, brown, yellow, and smoky varieties of quartz obtained principally near the Cairngorm, a summit of the Grampians, Scotland. The crystals are formed in cavities in the granite and are found in the loose material which accumulates when the rock decomposes. The mineral is also found in beautiful crystals near Pike's Peak, Colorado, in other western districts, in the Mourne Mountains in Ireland, in the Scottish island of Arran, and in Switzerland. The value of the stone depends on its color and its freedom from flaws and enclosures. Coarse specimens are almost valueless. When pale yellow, it is known as citrine, or false topaz; when brown, as cairngorm, or smoky quartz; when black and almost opaque, as morion. In Scotland it is much used in the making of jewelry.

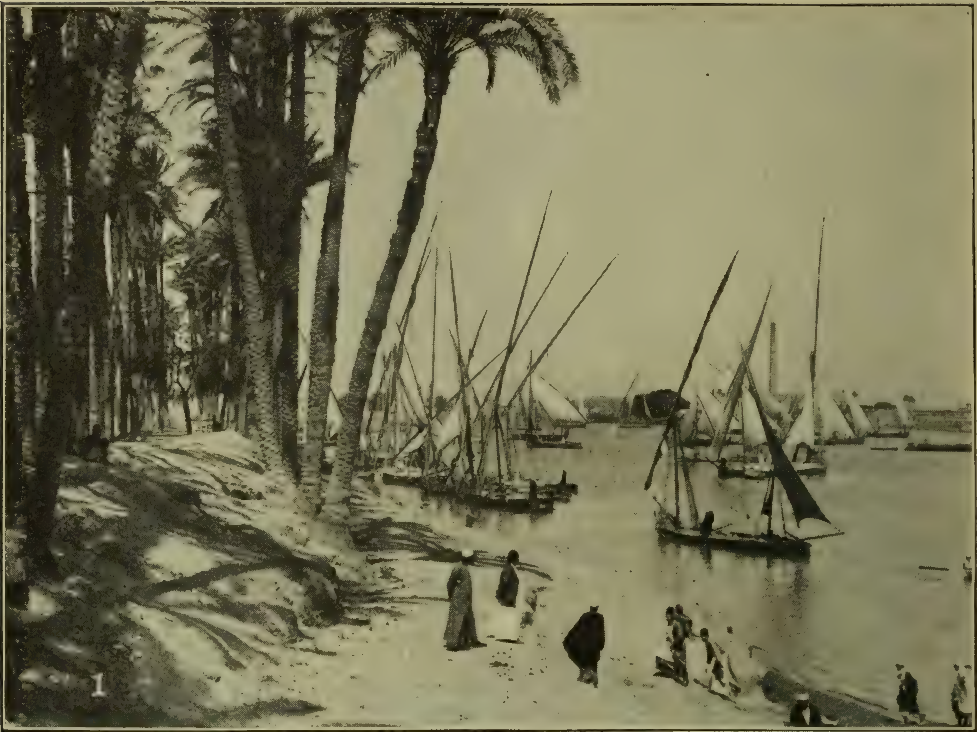
Cairns, Hugh M'Calmont Cairns, First Earl (1819–85), Lord High Chancellor of Great Britain, was born in Cultra, Ireland. He was educated at Trinity College, Dublin, and prepared in England for the bar, to which he was called in 1844, becoming Q.C. in 1856. He entered Parliament as member for Belfast (1852); was appointed solicitor-general by Lord Derby, and knighted (1858); became attorney-general (1866), and was made Lord High Chancellor (1868). He was created Viscount Garmoyle and Earl Cairns in 1878. Cairns was an accomplished orator, lucid in argument, but cold in manner.

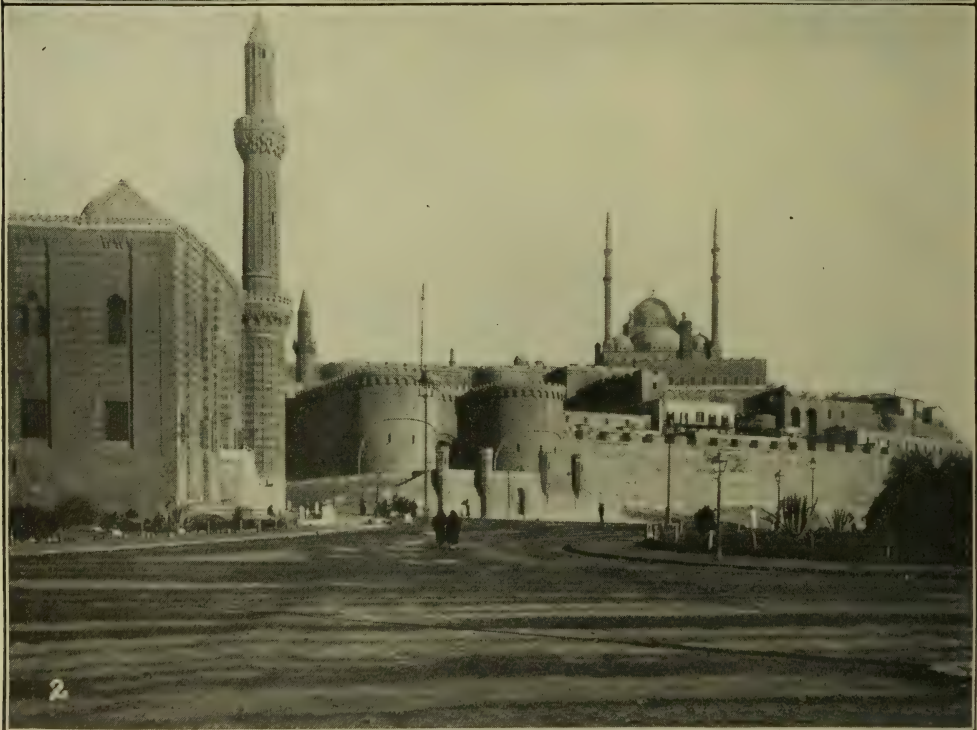
Cairo (*El-Kahira*), kī'rō, capital of Egypt, largest city in Africa, and an archiepiscopal see, is situated on the right bank of the Nile, about 12 miles south of the point where the river divides into the Rosetta and Damietta, and 130 miles southeast of Alexandria. It has rail connection with Jerusalem and Damascus.

Cairo covers an area of 11 square miles, with the barren Mokattam Hills to the west, on the outskirts of the desert. Suburbs are Masrel-Atîka, Shûbra, Gezireh, Zeitun, and Albariyeh, of which the last three have a large and increasing English population. There are two noted health resorts in the vicinity—Mena House, about 7 miles distant, specially favorable for pulmonary trouble; and Helwan, 15 miles (railway), celebrated for its sulphur baths and saline and chalybeate springs.

The city of Cairo consists of two main sections, the Arabian or native quarters, and the modern or foreign quarter known as Ismailiyeh. The central point of modern Cairo is the Ezbekiyeh Garden, covering an area of more than 20 acres and containing a great variety of rare and beautiful trees. To the south are the opera house, the khedive's palace, and the army barracks; to the west is the fashionable quarter, also the seat of foreign trade, with hotels, banks, English churches, consulates, and theatres. The main thoroughfare in the Arabian quarters is the Muski, lined with bazaars which, though inferior to those of Constantinople and Damascus, nevertheless contain much of novelty and interest to foreign travellers. The streets throughout the Arabian quarters are narrow, dirty, and crooked, and on market days are almost impassable. The finest of the city's many mosques is the Gami Sultan Hassan, built in 1356–9, in the form of an irregular pentagon in which the cruciform shape of the original *medresch* (school-mosque) has been incorporated; its southern minaret is said to be the loftiest in Egypt. The most ancient mosque is the Gami Amra, scarcely a trace of whose original structure now remains; others of interest are the Gami el-Muaiyad, the Mardani Mosque, one of the largest in Cairo, the Gami Mohammed Ali, and the Gami Ibn Tulun, the second oldest in Cairo, erected in 876–9. Other features of interest are the Museum of Geology; the Arabian Museum; the citadel, to the southeast of the city, said to have been built in 1179 with stones from the small pyramids of Gizeh; the Egyptian Museum founded in 1857 and containing Egyptian and Greek antiquities found in the Nile Valley, and the tombs of the caliphs and the Mamelukes.

The chief educational institution is the university, converted from the mosque of el-Azhar in 988; it is the most important educational centre in Islam and





1. From Ewing Galloway, N. Y. 2. From Publishers Photo Service

CAIRO, EGYPT

1. Bank of the Nile, showing 'dhows,' small vessels of Arabian origin used in river and coastwise traffic. 2. The Citadel, said to have been built in 1179, and the Mosque of Mohammed Ali.

has students from all parts of Egypt, averaging annually from 8,000 to 14,000 in number. It is supported by endowment, and tuition is free. There are also the Université Egyptienne, many English schools, missionary schools, schools of art and medicine, and the Khedival Library containing more than 75,000 volumes, many of great rarity and value. Manufactures include textiles, metal ware, perfumes, confectionery, and cotton goods. Pop. (1917) 790,939.

When Amr-ibn-el-As conquered Egypt in 640 A.D., he built a town upon the site of the Roman Babylon (Masr-el-Atîka), and called it El-Fostât. This town gradually spread north and northeast until it extended to the citadel, where Ahmed-ibn-Tulun erected a new town called El-Kata'i. Gôhar, the general of the Fatimite caliph Mui'zz in 969 A.D. erected the present town north of El-Kata'i. It prospered and grew until the fourteenth century, when it reached its zenith. Subsequently it suffered greatly from revolutions, rapine, and insurrections, and at length on Jan. 26, 1517, was seized by the Turks. Bonaparte occupied the city in 1800, but in 1801 the French garrison was forced to capitulate to the grand vizier. Under Mehemet Ali, Cairo began to assume its present modern aspect. See EGYPT. Consult Bénédite's *Cairo and its Environs;* Sladen's *Oriental Cairo, the City of the Arabian Nights* (1911); Devonshire's *Rambles in Cairo* (1917).

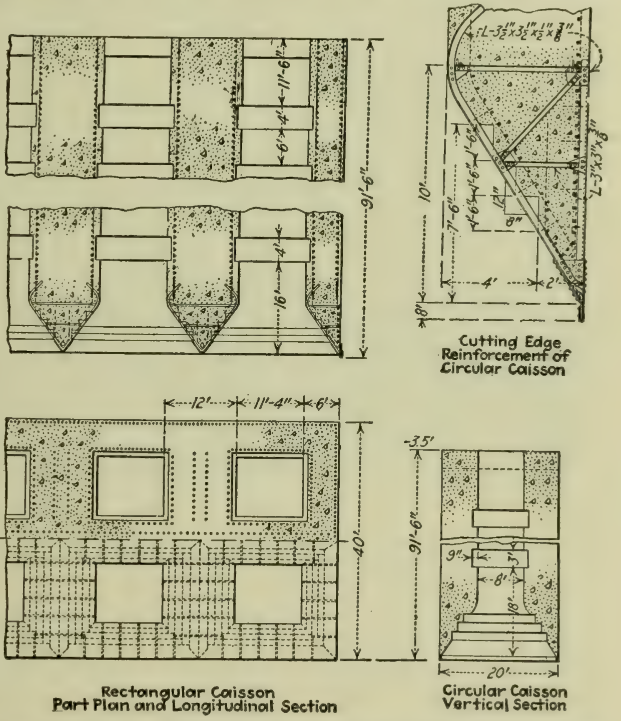
Cairo, kā'ro, city, Illinois, county seat of Alexander county, at the junction of the Mississippi and Ohio Rivers, and on the Cleveland, Cincinnati, Chicago and St. Louis, the Illinois Central, the Missouri Pacific, the Mobile and Ohio, and the St. Louis Southwestern Railroads; 125 miles southeast of St. Louis, Mo. A railroad bridge 2 miles long crosses the Ohio at this point. Features of interest are the terminal of the Federal barge line (Mississippi-Warrior Service) operating between Cairo (all year) and St. Louis (part of the year) and New Orleans, the public library, and St. Mary's Infirmary. Manufactures include ready-cut houses and other lumber products, work clothing, leather goods, and cotton oil products. The city is the centre of a cotton-growing district. Cairo is the Eden described in Dickens' *Martin Chuzzlewit.* Pop. (1910) 14,548; (1920) 15,203.

Cairoli, kī-rō'lē, BENEDETTO (1825–89), Italian soldier and statesman, was born near Pavia. In 1848 he took part in the war against Austria and after some years of exile in Piedmont, accompanied Garibaldi to Sicily (1859). He was severely wounded at Palermo (1860), was again with Garibaldi in the Tyrol (1867), and fought at Mentana. He became leader of his party when the Left came into power (1876), and the following year, on the fall of the Depretis-Nicotera ministry, formed a new cabinet with a Francophile and Irredentist policy. In 1878 he was severely wounded while endeavoring to protect King Humbert from attempted assassination by Giovanne Passanante. In 1879 he formed a coalition ministry with Depretis, retaining for himself the premiership and the foreign office, but because of the unpopularity of his policy in regard to the conduct of affairs in Tunis, he resigned in 1881.

Caisson, kās'son, from French *caisse,* or Italian *casone,* 'box,' a term used in military circles for a case to hold ammunition or a cart on which the ammunition for a field gun is transported; and in civil engineering with several meanings, as follows:

(*a*) The gates which close the entrances to dry or graving docks used for the inspection and repair of hulls of ships are called caissons. They are hollow steel structures, which may be pumped full of water or emptied at will. When empty, they float upright, like a ship, and are floated into place across the entrance to the dock. The caisson is built with a flat edge along the bottom and up the two sides. To close the dock the empty caisson is floated into position; after the edges have been brought to a bearing against the sill and side pieces of the dock entrance, water is admitted to the caisson, sinking it in place. As the water is pumped from the dry dock, the pressure of water acting against the outside of the caisson forces it tightly against the dock opening. Some forms of dock caissons are made to slide across the entrance and when the dock is open are housed in a recess built in the dock structure for that purpose.

(*b*) To raise or float sunken vessels, a platform fitted with hollow chambers which may be


L-3½″x3½″x½″x⅜″
11′-6″
6′-4″
91′-6″
4′
16′
10′
7′-6″
1′-6″
1′-6″
1′-6″
12″
8″
4′
2′
8′
L-3″x3″x⅜″
Cutting Edge Reinforcement of Circular Caisson
12′
11′-4″
6′
40′
91′-6″
3.5′
9″
8′
8′
20′
Rectangular Caisson Part Plan and Longitudinal Section
Circular Caisson Vertical Section

Open Caissons: Vertical Section and Plan of Rectangular and Circular Open Caissons for the Anchorage of the Philadelphia–Camden Bridge

The rectangular caissons are 40 ft. by 140 ft. Each caisson has 12 dredging wells in two rows of 6, each 10 ft. by 11 ft. The outside walls are 6 ft. thick, the central longitudinal wall 8 ft., and the interior transverse walls 9 ft. thick. The caissons were sunk to about 50 feet by dredging through the water-filled wells. After being sunk to full bearing on the rock with the cutting edge sealed into the rock, the wells were pumped out and filled with concrete. (Courtesy of Ralph Modjeski, Chief Engineer, Delaware River Bridge Joint Commission. From Engineering News-Record, New York.)

filled with water or emptied at will is sometimes used. This is termed a caisson or pontoon. The caisson is sunk by admitting water to the chambers attached to the sides of, or placed below, the vessel to be raised. The water being blown out of the chambers, the caisson rises, lifting the vessel with it. Floating dry docks are made on this principle.

(*c*) In building dock walls, harbor walls, or breakwaters, hollow boxes with bottom and four sides and open at the top have been used and termed caissons. Such caissons are built on land and towed empty to the place they are to occupy. They are then sunk by filling with earth, rock, or concrete. They are best built of reinforced concrete. When of large size they are divided into cells or compartments by longitudinal and lateral interior walls. A variation is sometimes made whereby the caisson as built ashore has a strong reinforced concrete bottom built on a timber platform, while the sides of the box are of timber and are detachable from the timbers of the platform. The box is floated to place, and sunk by filling with concrete. The timber sides are then detached. This type has been used largely for bridge piers, where the size of the caisson in plan is not excessive.

(*d*) A well or open caisson is used for making foundations for buildings or bridges. The caisson consists of a vertical hollow box, open at both ends, with a sharp cutting edge of steel or hard wood at the bottom. It is sunk through the ground by excavating within it, the box sinking as the excavation proceeds. It may be of any shape in plan and may be of timber, brickwork, cast iron segments bolted together, structural steel, or reinforced concrete. Large caissons may be subdivided by interior partitions. The caisson may be built to its full height before beginning to sink it, or it may be built up in successive *lifts* as the sinking proceeds. If the ground is dry, the excavation may be done by men standing on the exposed ground at the bottom. If water is present, dredging may be done.

In suitable soils there is no limit to the depth to which such an open caisson may be sunk. Through water-bearing ground, depths of 200 feet have been reached by this process. The resistance to sinking due to the friction between the earth and the outer surface or skin of the caisson, may be overcome by introducing vertical jets of water under pressure around the skin and by loading the top of the caisson with cast iron weights or *kentledge*. The caisson is kept in vertical position by adding extra weight on the high side. The frictional resistance varies with the nature of the earth, the material of the caisson, the quantity of water present, and the depth. Its recorded range is from 100 to 7,000 lb. per square foot. Perhaps 600 to 1,000 lb. per square inch may be considered a normal range. The method is especially applicable to soils of uniformly small texture, as sand and clay; logs or boulders under the cutting edge hinder sinking, and their removal under water of any depth is problematic.

When the caisson has been sunk to the depth required, it is filled with concrete. Sometimes such a caisson is sunk through water-bearing ground where the excavation has to be done by dredging methods but comes to rest with the cutting edge embedded or sealed with impervious ground. It may then be pumped out and the concrete filling placed *in the dry*. If not, the concrete can be placed in water by means of a *tremie*, which is a tube 8 to 24 inches in diameter. The lower end of the tube is kept on or in the concrete which is being deposited in the bottom of the caisson. The upper end is kept above the water and the concrete is poured down the tube, which is kept full of the flowing mass.

Bagged concrete is sometimes used under water, especially for the bottom layers. The bags are of cloth or of paper and are only partially filled. They pack together after they are sunk and are often arranged in place by divers.

(*e*) The hydraulic caisson is used for putting down foundations in ground which can be washed out, or *jetted*, with water under pressure. A caisson of this type consists of a cylindrical steel shell, to the bottom end of which is attached a heavy iron cutting edge of hollow triangular section with a series of small holes along its lower edge. This hollow edge is connected by pipes with a force pump on the surface. In sinking, water from the pump is forced through the cutting edge and escapes through the small holes. This washes the ground away from under the cutting edge, and the cylinder is sunk by weighting it on the top. As it sinks, successive lengths are added at the top. When the cylinder has reached the full depth, it is filled with concrete, in the dry if it is possible to pump out the water; if not, by tremie under water.

The Pneumatic Caisson. The principle of the pneumatic caisson is as follows: Water exerts a pressure of 0.4335 lb. per square inch on any point for every foot of depth which that point lies below the surface of the water. The pressure is directly proportional to the depth or *head*, so that for a ten-foot hydraulic head the pressure is 4.335 lb. per square inch, and for a 100 foot head it is 43.35 lb. per square inch. If, at the bottom of a caisson being sunk through water-bearing ground, air can be placed, which has been compressed to a pressure, in excess of that of the normal atmosphere, equal to that due to the head of water at the bottom of the caisson, a perfect resistance is interposed to the flow of the water, carrying the ground with it, into the bottom of the caisson, and the excavation may be done in the dry and without the movement of the surrounding earth into the caisson. In order to introduce the compressed air to the bottom of the caisson and to hold it there, a solid air-tight floor or deck is built across and toward the bottom of what would be, otherwise, an open caisson. This deck is high enough above the bottom for a man to stand upright. Through the floor means of access for men and materials are provided, as well as pipes connected with air-compressing machinery on the surface. Air at the proper pressure above the normal atmosphere is sent from the compressors through these pipes into the space below the air-tight floor to balance the pressure due to the head of water on the bottom of the caisson. As the caisson descends, the hydraulic head increases and consequently the pressure of the air introduced into the space, the *air chamber* or *working chamber*, below the air-tight floor must be increased. Pipes connecting with the outside air, telephone and electric light cables, water pipes and other utilities pass down from the surface and through the air-tight floor to the working chamber.

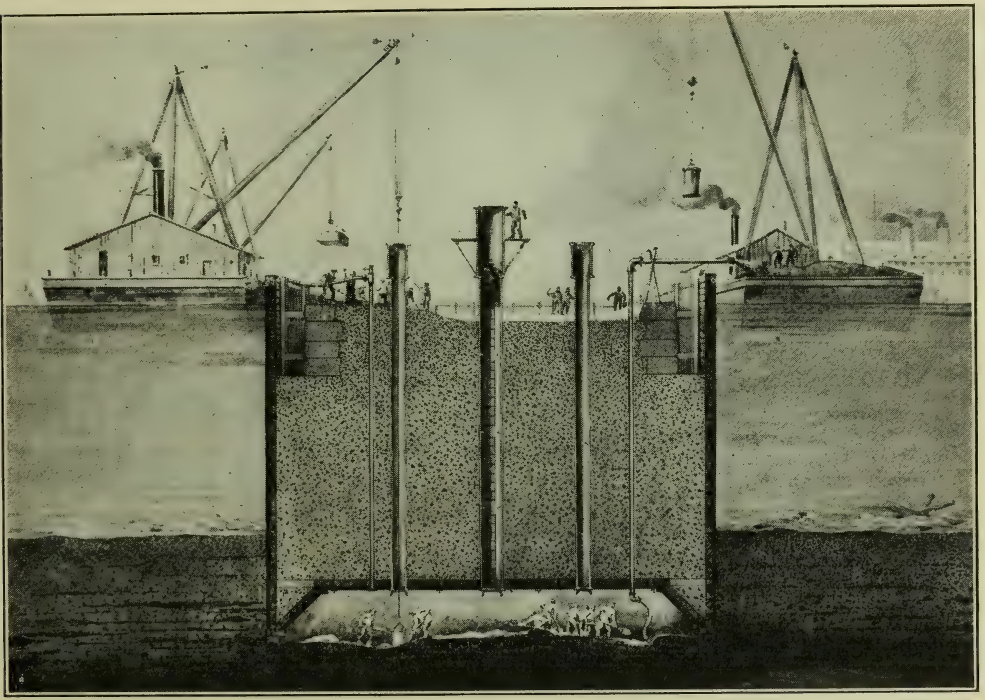
The history of the pneumatic caisson dates back to 1778, when Smeaton used a pump to introduce fresh air at pressure into a diving bell being used in repairing the foundations of a bridge at Hexham, across the River Tyne, England. This seems the first actual use of compressed air in foundation work. In 1820, at Howth, near Dublin, Ireland, where the method was again used with a diving bell, a Russian doctor, Hamel, made observations on the effect of air, on himself and on the men, at a pressure of 7 lb. per square inch above normal. In 1830 Cochrane patented an arrangement by which subaqueous shafts and tunnels could be built in the dry by the introduction within them of compressed air combined with the device later known as the *air-lock.* (See TUNNELS AND TUNNELLING). The first practical application of the Cochrane invention was made in 1839 by the French engineer, Triger, who sank a coal put of 3 feet 4 inches diameter at Chalons-sur-Loire to a depth of 65 feet through water-bearing strata to coal measures known to exist but hitherto unreachable.

In 1845, Triger had another similar work on his hands and was convinced that the compressed air method was suitable, also, for subaqueous tunnelling. In England, the foundations of the Chepstow Viaduct were taken down to a depth of 70 feet in the years 1843 to 1851; and in 1852, J. L. Fleming sank hollow cast iron bridge piers in Georgia under compressed air.

In the 1870's, there was a great boom in railroad building in the United States involving the bridging of such rivers as the Mississippi and the Missouri. The piers for these bridges were sunk by caissons under compressed air. The number of caissons sunk for bridge piers is now very great, some of them running to large size.

The first use of pneumatic caissons to form the foundations of a building was in 1893, for the Manhattan Life Building. Since then hundreds of buildings have had their foundations made in this way, and thousands of caissons have been sunk for this purpose. Buildings of the sky-scraper type, being of such enormous weight, must be bedded on the solid rock. In Lower New York City, for example, rock lies at depths from 50 to 80 feet below the surface. Above the rock comes a boulder-laden glacial deposit, known as hardpan, and above this, extending to the surface, a layer of quicksand 20 feet or more thick. These formations would make the sinking of open caissons a hazardous or even impossible task on a site surrounded by heavy buildings.

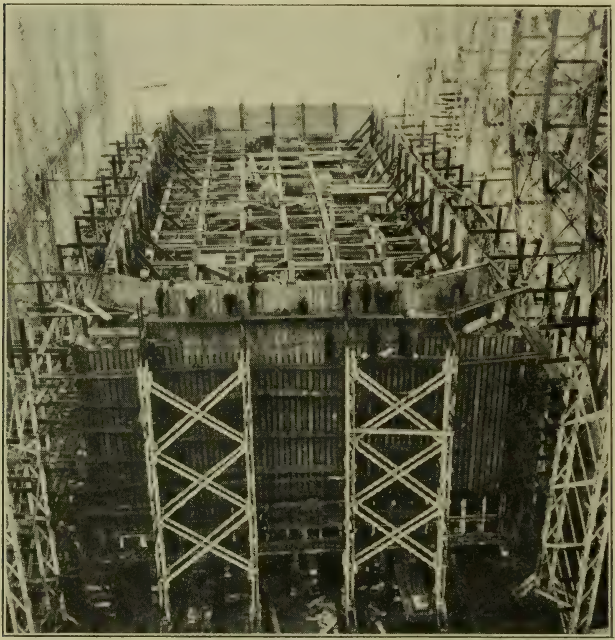
An essential part of the pneumatic caisson is the *air chamber* or *working chamber.* This is the bottom part of the caisson, in which the work of excavation is done and in which the air is kept artificially at a pressure high enough above that of the normal atmosphere to balance the pressure of the water. The air chamber is a bottomless box with side walls and roof. The edges of the side walls are formed in a cutting edge to help the caisson sink. Above the air-tight floor rise the sides, or cofferdam, of the caisson itself. Sometimes the caisson is built to its full height before sinking is begun. Sometimes it is built up, section by section, as the downward excavation proceeds and the caisson sinks. The cofferdam may be of wood, structural steel, or reinforced concrete. Giving access for men and materials between the working chamber and the open air, is the air shaft. This is a vertical pipe or tube provided with a



Pneumatic Caisson: Vertical Section of a Caisson during the Sinking Process

This shows the men at the bottom in the working chamber, which is full of compressed air which keeps out the water. In the middle is the vertical pipe or tube, with an air-lock at the top, through which the men pass to and from the outer air, and the working chamber. The lock-tender on his platform may be seen and a man entering the lower door of the lock. On either side of the man shaft are the shafts through which the excavated material is hoisted to the surface. Each of these has an air lock at the top. Next to these shafts are the blow-out pipes, through which fine material, such as sand, can be blown out to the surface by the compressed air when a valve is opened. The derrick scow on the right is hoisting a bucket of excavated ground or 'muck'; that on the left has the bucket in the working chamber, where the men are filling it. A derrick on the left, in the background, is delivering a 'skip' of concrete to the men who are filling the 'crib' or 'cofferdam' of the caisson with concrete, thus adding to its weight and helping it to sink. When the lower edge (the cutting edge) of the caisson has reached the bed rock, it is sealed tightly with clay or sacks of cement. Then the working space is filled solid with concrete, the shaftways are next filled, and the result is a solid mass of concrete, forming an artificial island on which the pier of a bridge may be founded. (Courtesy of Ralph Modjeski, Delaware River Bridge Joint Commission).

ladderway and extending the whole height of the caisson. Its lower end passes through the airtight floor or deck; the upper end terminates in the *air lock.* This is a steel vertical cylinder provided at each end with a door which may be closed against the air pressure. In coming out of the air, *locking-out,* the lower door of the lock is open and the upper one is closed. The men enter the air lock, close the lower door, and then open a valve within the lock which permits the compressed air inside the lock to escape until the pressure is reduced to that of the normal atmosphere. The upper door now may be opened and the men pass out. *Locking-in* is the reverse process. The lock may be at the bottom, or part way up or on the top of the air shaft. The higher it is the more opportunity there is for the men to escape in case of emergency. Materials are lowered and the excavated ground is hoisted through the air pipe in narrow buckets small enough to pass through the air pipe and the air lock. In small caissons men and materials are served by one air shaft and one lock. In large ones separate shafts and locks are used.



The Outside of a large Caisson to be sunk by Pneumatic Process, for a Bridge Pier

This shows the caulking of the timber cofferdam of Caisson A of the Philadelphia-Camden Bridge before launching at the shipyard of the New York Shipbuilding Corporation at Camden, N. J. The steel caisson, with its timber cofferdam, was built in the slipway of the shipyard, launched like a ship, towed to the site, and sunk to the river bed by pouring concrete over the roof of the working chamber. When the cutting edge reached the river bed, the excavation proceeded in the working chamber under compressed air until bed rock was reached. This was 60 ft. below water at Philadelphia and 85 ft. at Camden. Each caisson at launching weighed some 1800 tons. (Courtesy of Ralph Modjeski, Chief Engineer, Delaware River Bridge Joint Commission.)

As the excavation proceeds and the caisson sinks, it may be filled gradually, above the airtight floor, with masonry, brickwork, or (usually) concrete, or the filling may not be done until the caisson has been sunk to its full and final depth. Sometimes, water has been introduced as a weighting material above the deck. Since the frictional resistance tends to prevent the caisson from sinking as the excavation proceeds, it is useful to do the filling as it sinks. In order to help it sink, cast iron weights are piled on the top of the caisson. If the caisson gets *hung up,* *i.e.,* if it does not settle after a depth of excavation has been made, the pressure of the air in the working chamber is allowed to *blow-out,* *i.e.,* it is reduced a few pounds. This usually starts it. Sometimes, caissons have sunk so rapidly that the whole chamber has been filled with earth, forcing the men to flee up the air shaft. The ground, if hard, is removed by pick and shovel. If it is sand, a sand lift may be used. This is a pipe connecting the working chamber with the surface and provided with a valve in the working chamber. The sand is heaped around the lower end of the pipe in the chamber, the valve opened, and the resultant rush of compressed air up through the pipe carries the sand out to the surface.

The air or working chamber remains unfilled until the caisson has been sunk to its final depth. Then it is filled solidly with concrete up to the roof by means of concrete passed down through the shaft. After the working chamber has been filled, the air shaft and other passageways, or other vertical openings through the caisson may be filled so that the finished structure is a solid mass of masonry. Improved arrangements and devices have been introduced whereby the deck and the lining of the air shafts, etc., are eliminated, thus removing steel and timber, liable to decay, from the finished work.

Caissons may be of any shape in plan and may vary in size from an area of a few square feet for the foundations of building columns, to the great caissons which form bridge foundations, or the shafts of tunnels. The caissons for Eads' Mississippi Bridge at St. Louis (1867–74) were of boiler plate and measured 60 by 82 feet. Roebling's for the Brooklyn Suspension Bridge (1869–83) were of wood and measured 102 by 170 feet. Modjeski's for the Camden-Philadelphia Bridge (1921–5) were of steel and reinforced concrete and measured 70 by 128 feet. Holland's at the New Jersey pierhead, for the vehicular tunnel across the Hudson at New York (1921–6) were of steel and measured 37 feet 3 inches long by 50 feet 3 inches wide and 108 feet 6½ inches high.

A caisson may be built of wood, cast iron, structural steel, or reinforced concrete. Most of the early ones were of course of timber caulked and bolted; some were of cast iron plates bolted together through internal flanges. The modern tendency is toward structural steel and reinforced concrete. A great tensile stress is occasioned on the cofferdam by the frictional resistance when sinking.

An important development in the application of caissons to tall buildings is that whereby the caissons which support the outside wall columns have been made to form a continuous watertight wall or dam sealed into the rock and enclosing the whole area of the building. The building site being thus hermetically sealed from the inflow of sand, the interior foundation piers may be built in open caissons or cofferdams. The caissons used to form the dam are generally not over 30 feet in length, and are sunk close together, end to end.

Several devices have been used to close the gaps between the successive caissons. One method, known as stock ramming, consists of jetting pipes down between the adjacent caissons until hard pan is reached and then filling the pipes with clay cartridges rammed down by a pile driver. The pipes being gradually raised, the clay is forced into the gaps. By another method, the adjoining main dam caissons are sunk a foot or so apart with semi-circular or semi-octagonal recesses formed in their ends. After the main caissons have been sunk and concreted, small caissons are sunk in the slot or groove thus formed between the main caissons. In this way, the excavation between the main caissons may be carried to bed rock and a positive joint, extending to the full depth of the main caissons, may be made.

In the Federal Reserve Bank Building (1922), in New York City, the area enclosed is 182,000 square feet, and the volume 2,912,000 cubic feet. The lowest floor is 80 feet, and the deepest pier is 118 feet below the sidewalk.

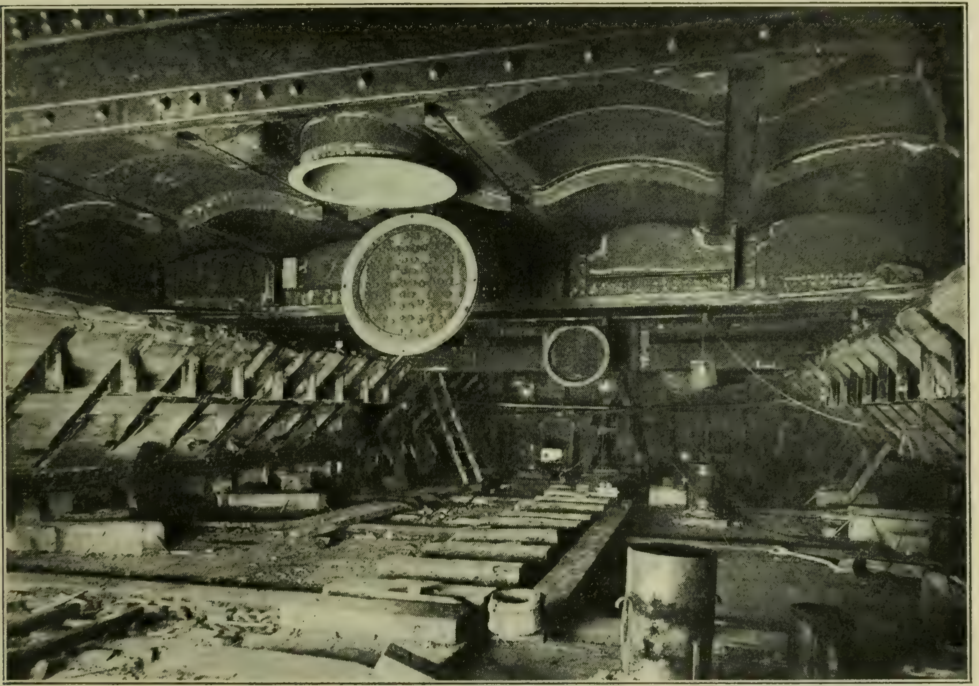
In the Hudson Terminal Building (1906–07) of the Hudson and Manhattan Railroad in New York, the volume below street level is 6,000,000 cubic feet. The area of 75,000 square feet is enclosed by 51 main dam caissons, each 8 feet thick and varying in length from 30 feet to 19 feet 3 inches.

Another use of caissons is to provide a foundation for dams. A most notable example is that of the Hales Bar Dam across the Tennessee River near Chattanooga. This dam is founded on a limestone rock so honeycombed with caverns that secure foundations appeared impossible until pneumatic caissons were applied. The foundations were made by sinking a double row of caissons, varying from 30 by 32 feet to 72 by 54 feet in plan, along the line of the dam to various depths down to 34 feet below the natural river bed, where solid rock was found.

It is becoming the practice to sink large caissons formed of structural steel across the line of shield-driven tunnels to be driven across and under a river or other waterway. The caissons are sunk near the shore line and are provided with circular openings, closed temporarily with steel plates, for the passage of the shields. The caissons having been sunk to the correct depth, the shields are erected within them, above the roof of the working chamber, which forms a floor on which the shield erection is done. When the shields have been assembled, a new air-tight deck is built across the caisson above the shield or shields. This deck is provided with air-locks for men and materials. Compressed air is applied to the shield-chamber thus formed, the plates which closed the circular shield openings are removed, the shield is forced by its jacks through the opening, and tunnelling is begun.

Noteworthy examples of this type of caisson are those used on the Holland Tunnel (1921–6) for vehicular traffic across the Hudson River, between New York City and Jersey City.

As with tunnelling under compressed air, so with pneumatic caisson work, the physiological effects of compressed air impose a bar on the application of the



Interior View of the Working Chamber of a Large Pneumatic Caisson, showing Steel Roof Construction and Steel and Concrete Cutting Edge.

The lower ends of two shaft-ways are clearly shown in the roof. This view is of the New York River Shaft of the Holland Tunnel and was taken in the drydock of the Staten Island Shipbuilding Company's plant, Mariners Harbor, New York. The caisson, after launching, was towed to the site and sunk. (Courtesy of Ole Singstad, Chief Engineer, New York–New Jersey Bridge and Tunnel Commission).

method beyond a depth of about 110 feet (see Caisson Disease). The extreme depth reached so far appears to be 113 feet, in one of the caissons of the Municipal Bridge, St. Louis, in 1911.

Bibliography..—Consult W. W. Patton's *Foundations* (2d ed. 1909); Jacoby and Davis' *Foundations of Bridges and Buildings* (1914); Hool and Kinne's *Foundations, Abutments and Footings* (1923).

Caisson Disease, known also as Bends and as Diver's Palsy, a disease due to the effects of compressed air, occurring among divers and workers in tunnels and caissons. It depends upon the fact that under the high pressure necessary for such work the nitrogen of the air dissolves in the blood and in the other fluids and tissues of the body, in amounts proportional to the pressure. With the rapid lowering of the pressure when the subject leaves the chamber of the caisson for the outer air, the dissolved nitrogen separates in bubbles in the blood, the synovial fluid of the joints, or the spinal cord or brain, inducing intense pain and even paralysis and death.

Physicians have studied the effects of compressed air on men and animals ever since Hamel constructed his compressed air diving bell in 1820. M. Pol at Douchy, France, was the first to suggest re-immersion in compressed air as a remedy for the condition. Dr. Jaminet, who was in medical charge of the men working on the St. Louis Bridge over the Mississippi, was the first to recommend a sliding scale of working hours (1851) the length of the shift to decrease as the air pressure increased; and Dr. Smith, who was in medical charge of the men working in the caissons of the Brooklyn Bridge (1871–2), was the first to examine men medically for work in compressed air and to formulate rules and regulations for their safety and health. He recommended and described the essential features of the hospital lock for the re-immersion (under medical supervision) of the sufferer from the disease. This device was first used in 1889 on actual work by E. W. Moire, then in charge of the work on the Hudson River Tunnel. It consists of a two-compartment horizontal air lock installed on the surface, so that a sufferer may be re-immersed as soon as symptoms appear, which is usually within an hour of decompression. Under recompression the nitrogen bubbles are reduced in size and their irritating effects correspondingly decreased, with a disappearance of symptoms in most cases. The patient is then cautiously decompressed.

Preventive measures consist in limiting the hours of work—from 8 hours in low pressure to 1½ hours in high pressures (43–48 lbs), with rest periods; employing only men with sound lungs and a sound heart; avoiding chilling as the men pass out of the compressed air; cooling the compressed air before it is sent into the working chamber, and supplying sufficient air so that it does not become foul.

Caithness, kāth'nes, county, Scotland, in the extreme northeast; area 697 square miles. The greater part of it is moorland, and the coast is bold and rocky. The chief crops are oats, barley, and potatoes. Fish are abundant. The county town is Wick. Pop. (1921) 28,284.

Caius, kēz, John (1510–73), English physician, best known by this Latinized form of his surname Key, was born in Norwich. He was educated at Cambridge and travelled and studied on the Continent, notably at Padua. He practised medicine in England; lectured on anatomy; and was physician to Edward vi., and afterward to Queen Mary. In 1557 he refounded Gonville Hall, Cambridge (founded in 1348 by Edmund Gonville, rector of Terrington, Norfolk), which henceforth was known as 'Gonville and Caius College.' In 1559 he was elected master of the college, an office which he held till his death, in London. He compiled a tract in English entitled *A Boke or Counseill against the Sweate or Sweating Sicknesse*, and wrote a number of books and treatises in Latin.

Caivano, kī-vä'nō, town, Italy, in the province of Naples, 7 miles northeast of Naples. It has a flourishing trade in fruit, wine, and olives. Pop. (1911) 12,986.

Caix, kä-ēks', Napoleone (1845–82), Italian philologist, was born in Bozzolo, near Mantua. He became professor of ancient languages at Parma in 1869, and from 1873 until his death occupied the chair of Romance languages and comparative philology at Florence. His works, which deal with the Italian, Spanish, and Romance languages, are distinguished by their scientific method, and exhibit great ingenuity. His publications include: *Saggio sulla storia della lingua e dei dialetti d'Italia* (1872), *Studi d'etimologia italiana e romanza* (1878), and *Le origini della lingua poetica italiana* (1879), this last being the most important.

Cajabamba. See Riobamba.

Cajamarca, kä-hä-mär'kä, city, Peru, capital of the department of Cajamarca, on the eastern slope of the Western Cordillera; 370 miles north of Lima. It is an ancient Inca city and in the neighborhood are the thermal 'Baths of the Incas.' Manufactures include hats, textiles, and tobacco. Coal, copper, gold, and silver are found in the district. Historically the town is notable as the scene of the capture and death of Atahualpa (1533). Pop. 12,000.

Cajatambo, kä-hä-täm'bō, town, Peru, capital of the province of Catajambo; 100 miles north of Lima. It produces cereals and textiles, and mining and cattle raising are carried on. Pop. 4,000.

Cajeput, kaj'e-put (*Melaleuca leucadendron*), an evergreen tree, bearing pendulous spikes of white flowers, found throughout Australia and South Asia, known in the former country as the tea tree. The bark, pale buff in color, peels off in thin layers and is useful in packing because of its durability and imperviousness to water.

Oil of cajeput, distilled from its leaves or from those of *Melaleuca minor*, is a greenish colored aromatic oil, pungent and volatile, resembling oil of cloves in its action. It is used externally as a stimulant and counter-irritant.

Cajetan, kaj'e-tan, Jacopo, known in religion as Tomaso de Vio di Gaeta (1469–1534), Italian theologian, was born in Gaeta (Cajeta). He entered the order of the Dominicans in 1484, became professor of theology and philosophy at Brescia and Pavia, and in 1509 was elected general of the order. Leo x. made him a cardinal (1517), and sent him the following year on a fruitless mission to Germany to examine Luther and quiet the commotion raised by his schism. In 1530 he was summoned to Rome, where he was continually consulted by Pope Clement vii. In Clement's behalf he wrote the decision against the granting of a divorce to Henry viii. from Catharine of Aragon. He was a stedfast opponent of the Reformation. His works (*Opera Omnia*, 1639) include a translation of the Bible, and commentaries upon portions of Aristotle and Aquinas.

Calaban'ga, pueblo, Luzon, Philippine Islands, in the province of Ambos Camarines, on the Calabanga River, 3 miles from the shore of San Miguel Bay. Pop. (1918) 7,953.

Cal'abar Bean, the poisonous seed of *Physostigma venenosum*, a shrub native to Western Africa, bearing violet-colored flowers and flattened pointed pods, each containing two or three of the reddish brown seeds or beans. The seed contains two alkaloids —calabarine and physostigmine or eserine. The latter, administered internally, increases glandular secretion and intestinal peristalsis. It has little effect on the cerebrum, but acts strongly on the vital centres in the medulla, and on the spinal cord, where it produces feebleness of muscular movement, and slightly affects sensation. It is given both by the mouth and hypodermically, for the relief of tetanus, and to antagonize the action of atropine. Its chief value in medicine lies in its action on the third cranial nerve, through which it acts on the eye, causing contraction of the pupil and relief of ocular tension. It paralyzes accommodation for distant objects. It has been recommended in the conjunctivitis of infants, in ocular paralysis due to diphtheria, and in glaucoma and corneal ulcers. It is believed to stimulate all unstriped muscle, and to increase all secretions.

Calabar, New, town, Nigeria, Africa, on the New Calabar River, one of the most eastern branches of the Niger delta; 100 miles east of Old Calabar.

Calabar, Old, town, Nigeria, Africa, on the left bank of the Calabar River. The native quarter is known as Duketown. It is an important trade centre and exports large quantities of palm oil and palm kernels. In 1904 the name Old Calabar was officially changed to Calabar. Pop. about 15,000.

Calabar Bean

Cal'abash, the hard shell of the fruit of the calabash tree (*Crescentia cujete*), of the order Bignoniaceæ, native to West Africa, Tropical America, and the West Indies. It has large white flowers which grow on the trunk and on the older branches. The shell is used for cups, jars, pots, kettles, and other vessels. The rind of *Lagenaria vulgaris*, of the family Cucurbitaceæ, is also known as Calabash, or Bottle Gourd (q. v.).

Calabozo, kä-lä-bō'zo, town, Venezuela, capital of the state of Guárico, on the Guárico River; 120 miles southwest of Caracas. It is the seat of a college and a bishopric, and is a shipping point for lumber and agricultural produce. Pop. about 8,000.

Calabria, kä-lā'bri-*a*, a territorial division of Southern Italy, comprising the provinces of Catanzaro, Cosenza, and Reggio, and occupying what is known as the 'toe' of Italy; area, 5,819 square miles. The southern extensions of the Apennines, 4,500 to 6,500 feet, traverse the region, except for the valley of the Crati. In the central part is La Sila, a mountainous area, thickly wooded; in the extreme south, overhanging the Strait of Messina, are the heights of Aspromonte (6,420 ft.). Marble, alabaster, salt, and copper are found, and grain, fruit, hemp, and flax grow in abundance. Pop. (1921) 1,503,201.

Calabria (formerly Bruti) was colonized by the Greeks in the eighth century B.C., and was known as Magna Græcia, or Greater Greece. Among the settlements were the great cities of Croton, Sybaris, Thurii, Scylacium, Caulonia, and Rhegium, and, at a later date, Monteleone. In the Middle Ages, Calabria, as it came to be called, fell into the power of the Saracens, who in the eleventh century were expelled by the Sicilian Normans under Robert Guiscard. Henceforth Calabria was governed by Naples. In 1763, 1905, and 1908, stupendous earthquakes occurred in the district.

Until the end of the Byzantine supremacy (seventh century), the name Calabria was applied also to the peninsula on the northeast of Gulf of Otranto, on which stood the powerful Greek cities of Brundusium (Brindisi), Tarentum (Taranto), Hydruntum (Otranto), and Lupiæ (Lecce). Consult G. Gissing's *By the Ionian Sea*.

Cala'dium, a genus of plants belonging to the family Araceæ. They are grown chiefly on account of their beautiful foliage. The leaves are generally broad and arrow-shaped, often marked with shades of white, red, yellow, or purple. *C. bicolor*, a native of South America, and *C. picturatum* have supplied many of the fancy-leaved varieties. The variegated hybrids are numerous. Caladiums have large rhizomes, which can be kept through the winter in a tolerably warm place. An abundance of water, protection from bright sunshine, and warm, humid air are necessary for them.

Calahorra, kä-lä-ō'rä, city and episcopal see, Spain, in the province of Lagroño, 75 miles northwest of Saragossa. It is one of the oldest cities in Spain, and was the birthplace of Quintilian. The main feature of interest is the cathedral, which is a place of pilgrimage. Wine and agricultural produce are exported. Pop. (1920) 10,791.

Calais, ka-lā', seaport town and fortress, France, in the department Pas-de-Calais, on the Strait of Dover, 21 miles east of Dover, England, on the opposite shore. It is the chief port for passenger traffic between England and the continent. It consists of two parts, Calais-Nord, the old town, and Calais-Sud, the modern industrial section. Calais-Nord, which lies between the citadel and the harbor, has narrow, irregular streets and quaint old buildings; its chief features of interest are the old Hôtel de Ville, with a museum and art gallery, the church of Notre Dame, and the Hôtel de Guise, founded by Edward III. as a woolstaplers' guildhouse. Calais-Sud, much larger and more modern, contains the new Hôtel de Ville, the banks, theatres, factories, and shops. Calais has a fine harbor accessible to the largest vessels. It is an important fishing centre, and has extensive manufactures of lace and tulle. Pop. (1921) 73,001.

Calais was taken by Edward III. in 1347 and remained for two hundred years under English rule. In 1558 the Duc de Guise expelled the English garrison. Here Mary Stuart embarked for Scotland in 1561 and here Louis XVIII. landed in 1814 to assume the French crown. In the Great War Calais was an important British base for supplies. The town suffered severely from aerial raids in 1917–8.

Calais, kal'is, city and port of entry, Maine, in Washington county, on the St. Croix River, at the head of tidewater, 12 miles from Passamaquoddy Bay. It is on the Maine Central Railroad, and is accessible to the Canadian Pacific at St. Stephen, Canada, with which it is connected by bridge. It is the most northeasterly seaport in the United States. Features of interest are Memorial Park, the public library, and Calais Academy. The St. Croix furnishes good water power and there is a large lumber trade, as well as shoe factories, woollen mills, machine shops, quarries of granite and marble, lime kilns, and shipyards. Pop. (1910) 6,116; (1920) 6,084.

Cal'amander Wood (*Diospyros hirsuta*), the wood of a tree native to India and Ceylon, used as a cabinet wood and valued for its beauty. The prevailing tint is a fine chocolate, deepening into black, or fading into fawn, varied with rich shades of brown. It is known as variegated ebony.

Calamba, kä-läm'bä, pueblo, Luzon, Philippine Islands, in the province of Laguna, on Laguna de Bay; 17 miles southwest of Santa Cruz. It is the birthplace of Dr. Jose Rizal y Mercado, the Filipino martyr. Pop. (1918) 18,062.

Calame, ka-lam', ALEXANDRE (1810–64), Swiss artist, was born in Vevey. He early evinced a taste for painting, and in 1829 became a student under Diday, of whom he later became a formidable rival. He traveled in France, Holland, and Italy, studying the works of the masters in those countries, but although they influenced his technique he remained always the painter of Alpine scenery and his native land. Among his best known works are *Le cours du Giffre* (1835); *L'orage a la Handegg* (1839); *Le Mont Rose* (1844); *Le lac des Quatre-Cantons.* His work is somewhat too decorative, but his coloring is fine and his perspective good.

Calamianes, kä'lä-mē-ä'nās, or Culion Islands, group of islands, Philippines, in Palawan province, lying between the Mindoro and the China Seas and forming a connecting chain from Mindoro to Palawan. There are 98 islands in the group, with an area of 677 square miles. There are only two large islands, Busuanga (388 sq. m.) and Culion (176 sq. m.). The industries are cattle raising, and the collection of bamboo, edible birds' nests, sea-cucumbers, turtles and shells. The climate is unhealthful. Coron, Busuanga Island, the chief town, is 197 miles southwest of Manila. Pop. (1918) 7,570.

Calamine, kal'a-min, a name given to two common ores of zinc—the one being a hydrous silicate, hemimorphite, or electric calamine; the other the carbonate, more properly known as smithsonite. Both are frequent in veins which carry zinc blende, the commonest of the zinc ores, and seem to be derived largely from the decomposition of that mineral. They are pale yellow, pink, brown, blue, green, or colorless, and are often mixed in a fine yellowish powder, known to miners as 'dry bone.' Frequently they take the form of encrusting or stalactitic masses. They are found in New Jersey, Pennsylvania, Virginia, Missouri, and other parts of the United States, and in Germany, Belgium, England, Scotland, and Siberia.

Cal'amint, a genus of plants belonging to the order Labiatæ, much resembling the thymes and sages. The species are mostly aromatic herbs with purplish or white flowers and are reputed to have medicinal properties. Several hardy species are known. The tiny *Calamintha glabella* and *C. alpina* are suitable for the rock garden, and the larger *C. grandiflora,* which flowers in June, is often used for a general border. *C. officinalis,* the common calamint of old herbalists, a plant used in domestic medicine, is a native of Europe.

Cal'amite, a well-known plant fossil which occurs in Carboniferous strata, and in external appearance somewhat resembles a reed. It is an extinct representative of the group Equisetaceæ. The stems are often found to terminate beneath in a bluntly conical, tapered point; while towards their apex they bear many branches, which arise in whorls from certain of the nodes. On these branches finer branchlets are planted in similar fashion, and the ultimate ramifications bear whorls of small linear leaves which are known as annularia, asterophyllites, and sphenophyllum. Calamite is not the stem of a plant, but a cast or impression of the pith cavity.

Cal'amus, a genus of Asiatic palms, all the species of which, some scandent, are of great beauty. Among the smaller species are the spiny *C. ciliaris,* in which the pinnate leaves are clothed with hairs, and *C. spectabilis.* The species *C. rotang, C. tenuis,* and *C. viminalis* furnish canes used for chairs, baskets, and mats, while *C. scipionum,* whose stems are thicker and larger, furnishes Malacca canes used for walking sticks. Some of the species are known as Rattan. See also Dragon's Blood.

Calamus. See Acorus.

Cal'amy, Edmund, The Elder (1600–66), English divine, was born in London. He was educated at Cambridge, became vicar of St. Mary's in Swaffham, prior in 1626, but the same year removed to Bury St. Edmunds, where he was lecturer until 1636. Because of his opposition to the *Book of Sports,* he left the Episcopal Church and became a Presbyterian. He was appointed in 1639 minister of St. Mary's, Aldermanbury, London, where he officiated for twenty years. He was one of the five authors of the work entitled *Smectymnuus* (1641), written in controversion of Bishop Hall's *Divine Right of Episcopacy.* After the Restoration he became chaplain-in-ordinary to Charles II. and was one of the representatives of the Presbyterians at the Savoy Conference. In 1662 he was ejected from his living by the Uniformity Act, and committed to Newgate for a short time. He wrote the *Godly Man's Ark* (1657) and compiled the *Souldier's Pocket Bible* for the use of the Commonwealth Army.

Calamy, Edmund (1671–1732), English theologian, grandson of Edmund Calamy (q. v.), was born in London. He published forty-one works, vigorously upholding liberty of conscience as the foundation of non-conformity. The best known are his *Account of the Ministers Ejected after the Restoration* (1689) and his *Historical Account of My Own Life,* which was not published until 1829.

Calandrinia, kal-an-drin'i-a, a genus of plants of the rock purslane order (Portulaceæ). There are about sixty species, all of which are fleshy, with sprawling or trailing habit and entire leaves. Some are annual and some perennial; but all are usually raised from seed, and treated as half-hardy annuals. The flowers open fully only in sunshine. Among the best known species are *C. discolor,* with pinkish purple petals and yellow stamens, and *C. umbellata,* which bears large, beautiful, crimson flowers.

Calanthe, ka-lan'thē, a genus of terrestrial orchids having broad, plaited leaves and long spikes of large white, lilac, or pink flowers. Some species are deciduous and some evergreen; the greater number of varieties grown by horticulturists are hybrids obtained by artificial crossing. Best known among the species are the white flowered deciduous *C. vestita,* with its varieties; *C. veratrifolia* and *C. veitchii,* with many varieties; and *C. masuca,* which bears violet flowers.

Calanthe vestita

Calapan, kä-lä-pän', pueblo, Mindoro, Philippine Islands, capital of Mindoro province, on Calapan Bay; 85 miles south of Manila. There is no sheltered anchorage, and during the months of October, November and December, when a heavy surf is running, the mails cannot be landed. Hunting, fishing, and weaving are the chief occupations. Pop. (1918) 12,689.

Calarasi, kä-lä-rä'sē, or Stirbey, town, Roumania, capital of the province of Jalomitsa, on the Borcea arm of the Danube, opposite Silistria. Pop. 11,000.

Calas, ka-las', Jean (1698-1762), Protestant merchant of Toulouse who, his son, Mark Antony, having hanged himself, was accused of having strangled the youth to prevent him from abjuring Protestantism and adopting Roman Catholicism. On this charge the old father was condemned by eight judges to be tortured and broken on the wheel, and the sentence was carried out. Calas' other son was banished, his daughters were placed in convents, and his wife escaped to Switzerland, where Voltaire took up her case, and got the sentence annulled. Consult Voltaire's *Sur la Tolérance;* Dryandar's *Der Prozess Calas.*

Calascibetta, kȧ-lä'shi-bet'tȧ, town, Caltanissetta province, Sicily; 15 miles northeast of Caltanissetta. It is built on a steep and isolated height (2,880 feet), opposite Castrogiovanni. Wine, olive oil, and silk are produced. Pop. 9,000.

Calash' (French *calèche*), a light four-wheeled carriage with a folding roof or hood.

Calasiao, kä-lä-sē-ä'ō, pueblo, Pangasinan province, Luzon, Philippines, on the Tolon River and on the Manila road; 9 miles east of Lingayen. Many important industries are conducted in the district, including tobacco and hat manufacture and weaving. Pop. 17,000.

Calatafimi, kä-lä'tä-fē'mē, town, Trapani province, Sicily; 32 miles southwest of Palermo. In the vicinity are the ruins of the ancient *Segesta;* and about 2 miles to the southwest Garibaldi defeated the Neapolitans in 1860. Pop. 12,000.

Calatayud, kä-lä-tä-yōōth', city, Saragossa province, Spain, on the main railway to Madrid; 52 miles southwest of Saragossa. It is a curious ancient town on a rocky eminence, with a splendid ruined castle. It is the site of the ancient *Bilbilis,* and birthplace of Martial the Latin poet. Pop. 11,500.

Cala'thea, an American group of plants of the ginger family, which have beautiful leaves springing from a short, root-like stem.

Calatrava la Vieja, kä'lȧ-trä'vȧ lä vyā'hȧ, a ruined city of Spain, on the Guadiana, 12 miles northeast of Ciudad Real. Its defence against the Moors, undertaken by Raymond, abbot of Fitero, and Diego Velasquez in 1158, after it had been abandoned by the Templars, is famous on account of its having originated the Order of the Knights of Calatrava. Their almost uniform success against the Moors gave rise to rashness, and in 1197 they were defeated and nearly exterminated, the survivors transferring the seat to the castle of Salvatierra. Since 1808 the body has been continued as an order of merit.

Calauria, a small island (now POROS) in the Saronic Gulf (now Gulf of Ægina), Greece. It contained a temple of Poseidon, which was regarded as an inviolable sanctuary. Demosthenes took refuge there from Antipater, and poisoned himself to escape arrest in 322 B.C.

Calaveras, kä-lä-vā'räs, county, California, situated near the middle of the State, with a picturesquely varied surface, including hills, canyons, prairies, and forests of oak and pine. The country is rich in granite, quartz, limestone, and slate, and copper and gold are mined. Its fame is due especially to its grove of *Sequoia gigantea* at Bigtrees (q.v.). Area 1,080 square miles. Pop. (1910) 9,171.

Calaveras Skull, a fossil skull found in the auriferous gravels of Calaveras county, California, in 1866, and believed by some to belong to the Tertiary period, thus indicating the presence of Tertiary man in that region. The skull is similar to those of modern Californian Indians, however, and many hold that it was obtained from a comparatively recent grave.

Calbayog, käl-bä'yōg, pueblo, Samar Island, Philippines; 29 miles northwest of Catbalogan. The anchorage is exposed to the southwest monsoon. It has steamboat communication with Manila. Hemp export and fishing are its chief industries. Pop. 16,000.

Calbe, town, Germany. See KALBE.

Calburga. See GULBARGA.

Calcaire Grossier, kȧl-kâr' grō-syā', a richly fossiliferous series of limestones and marls which are developed in the Paris basin, and belong to the middle Eocene period. It is about a hundred feet thick, contains a great variety of fossil shells, and has yielded also numerous remains of mammals.

Calca'rea, or CALCISPONGIÆ, the group of sponges in which the skeleton consists of spicules of lime. See SPONGES.

Calca'reous (Latin *calx*), in chemistry, is a term applied to substances containing much lime. Thus *Calcareous Waters* are those which hold in solution much carbonate and sulphate of lime, and which are generally known as 'hard waters.' *Calcareous Rocks* (q.v.) are those in which lime forms the prevailing element. *Calcareous Soils* (q.v.) are produced from the disintegration of calcareous rocks.

Calcareous Rocks consist of carbonate of lime, whether in the form of calcite or aragonite. The majority have been formed in the sea, and are composed of the remains of marine animals, such as corals, crinoids, brachiopods, molluscs, echinoderms, and foraminifera. Similar materials are accumulating in the sea bottom at the present day as banks of shells or as coral reefs. The lime salts which exist in solution in sea water are extracted by the living tissues of these animals, and deposited in the form of carbonate of lime by their shell-secreting membranes. Most limestones, in consequence, are of organic origin; as a rule, they contain numerous fossils which indicate this; but others have formed as precipitates by the evaporation of calcareous solutions. Stalactite and calc-sinter belong to this group, and many geologists believe that oolites are of similar derivation. (See OOLITE.)

Another series of calcareous rocks is crystalline, and may be called the marbles, as marble is a typical example. They are associated usually with the crystalline schists and with the contact rocks which are developed by the action of the heat, given out by great masses of granite as they cool, on the rocks surrounding them. Most geologists hold that they were originally limestones of organic origin, and that their present crystalline structure, and the absence of fossil remains, are due to the metamorphism, including recrystallization, which they have undergone, and which have obliterated all traces of their original character.

Calcareous Soils. Most highly calcareous soils are not noted for their fertility or agricultural value. They are apt to be very thin, and full of hard nodules of flint, the insoluble ingredients of the chalk or limestone beneath, and are more adapted for sheep pasture than for growing grain. But if in other respects the soil is good, the presence of a considerable amount of calcareous matter does no great harm; and soils which contain no carbonate of lime are invariably improved by the addition of chalk or some other lime compound. Many residual calcareous soils derived from limestones are very fertile, and are valuable especially for grasses, as in the famous blue-grass region of Kentucky. The acids generated by the decomposition of vegetable matter require to be neutralized, and for this purpose carbonate of lime is essential; hence peaty soils are much benefited by being dressed with chalk.

Calcareous soils are soft, friable, and 'light'; in other words, they are easily worked. They are comparatively dry, as they are more porous than clay soils, though less so than sands or sandy loams; and they retain a fair amount of water, so that they are not so readily parched in dry weather. Owing to their light color, they absorb heat only slowly, so that in spring they do not warm so rapidly as dark soils, and are consequently somewhat late. They do not become acid or 'sour,' and are usually rich in phosphates which are a frequent ingredient of limestones; but, on the other hand, they are poor in potash. See SOILS.

Calcareous Tufa. See CALCSINTER.

Calcasieu, käl′ka-shōō, river of Louisiana, draining the southwest corner of the State. It rises west of the centre of the State, near the Red River, flows southeast in Rapides county, and southwest in Calcasieu county, at the extreme end of which it enters Lake Calcasieu, which has a passage to the sea, known as Calcasieu Pass. The river is 230 miles long, and is navigable for boats of light draught for a large part of its course.

Calcedony. See CHALCEDONY.

Calceola, kal-sē′ō-l*a*, or SLIPPER CORAL, a characteristic fossil of the middle Devonian, is so called from its resemblance to the toe of a slipper, being conical, slightly flattened on one side, curved, and tapering to a blunted point. It is abundant in the limestones of the Eifel, on the west of the Rhine, in Germany.

Calceola′ria, a genus of plants, natives of South America, Mexico, and the West Indies, belonging to the order Scrophulariaceæ. From a gardening point of view the genus may be divided into two classes, composed respectively of herbaceous and shrubby varieties. The herbaceous kinds are usually raised from seeds, which are sown in July on light soil composed of equal parts of sand, leaf mould, and loam. The flowering season is from May to July. The shrubby kinds are usually propagated by means of cuttings, preferably taken in September, and placed in a cold frame or greenhouse in a mixture of fine fibrous loam and silver sand, and kept shaded for a week. As soon as they are well rooted the young plants should be planted in small pots, and placed in a frame exposed to direct sun heat. At about the end of February the points should be pinched off, and the plants transferred to larger pots. As they grow, they should again be moved, until they are planted out in May.

The saccate flowers of Calceolaria resemble 'lady's slippers,' and are variously spotted and colored, with rich hues, generally combined with yellow. They occur in large clusters, and are much hybridized. *C. crenatiflora*, from Chile, is a spotted, yellow species; *C. purpurea*, violet-flowered, comes from Peru; *C. integrifolia* is a shrubby species with small yellow flowers.

Calchaqui, kȧl-chä′kē, is a tribe of South American aborigines, now extinct, if the analogous people on the north coast of Chile be not a remnant. The tribe formerly inhabited the district around Tucuman, in North Central Argentine, and have left behind stone-built tombs, in which have been discovered mummies and gold and copper ornaments. They may therefore have been civilized by the Incas, who conquered them about the middle of the fifteenth century. Some details of their life and habits have been handed down to us, but we know little of their language.

Calchas, kal′kas, the famous soothsayer of the Greeks in the Trojan War, was the son of Thestor and Mycene. He foretold the length of the siege, and when the fleet was detained at Aulis by adverse winds, demanded the sacrifice of Iphigenia. He is said to have died at Colophon, from chagrin at being surpassed in soothsaying by one Mopsus.

Calcif′erous Formation, a term used by American geologists for the lowest part of the Ordovician series. It is a great limestone group, sometimes dolomitic and at other times arenaceous, which is well developed in New York, New Jersey, Michigan, etc., as well as in Canada, while equivalents of it are found at many places within the Mississippi Valley.

Cal′cimine, a composition of whiting or zinc white, glue, water, and sometimes pigments, for finishing plastered ceilings and walls.

Calcina′tion, a term used in metallurgy to denote the operation of roasting or burning ores or chemicals. The process varies according to the nature of the ore, and may have for its object to expel certain volatile constituents, such as sulphur, arsenic, or carbon dioxide, to produce an oxide. Chalk ($CaCO_3$) is calcined in kilns to expel the carbon dioxide gas and produce quicklime ($CaCO$).

Calcite, one of the commonest and most important of minerals, composing such rocks as marble, limestone, chalk, and oolite, and assuming an extraordinary variety of colors and forms, as stalactites, veins, concretions, petrifactions, incrustations, etc. It is the principal ingredient of the shells of most marine animals, being obtained by them from sea water, in which compounds of lime exist in solution. (See ARAGONITE.)

Calcite often occurs in beautiful crystals (see DOUBLE REFRACTION.) Over a thousand different forms and combinations of calcite crystals are known. Iceland Spar is clear transparent calcite. Two of the commonest forms are known to miners as Nail-Head Spar and Dog-Tooth Spar. Calcite is soft, and scratches easily with the knife (hardness = 3). It is easily dissolved in weak cold acid, and bubbles of carbonic acid gas are given off. It is a frequent product of decomposition in rocks, and occurs also as pseudomorphs after other minerals. In composition it is carbonate of lime, but that compound forms also another mineral, Aragonite (q.v.).

Cal′cium, a metallic element, fifth in abundance in the earth's crust, of which it forms 3.5 per cent., is a constituent of many compounds found in nature in enormous quantities, as Calcium Carbonate (chalk, marble, coral) and Gypsum. Other natural compounds are Dolomite, Fluorspar, Apatite, Alabaster, and Garnet. Calcium compounds are essential to life, being found in leaves, and in the bones, teeth, and shells of animals.

Calcium is prepared by electrolysis of the fused chloride. It has a yellowish lustre, is tough, and somewhat harder than lead. Specific gravity, 1.54; melting point, 760° C. Chemically it is one of the alkaline earth elements (see PERIODIC LAW). It tarnishes in moist air, and reacts readily with water. It burns with a brilliant crimson light. As it is basic, a calcium salt corresponding to any acid is possible—thus calcium nitrate corresponding to nitric acid. Many of these salts are of great importance. Following are the most important compounds:

Calcium Bicarbonate, $CaH_2(CO_3)_2$. Calcium carbonate is soluble in a water solution of carbonic acid. If carbon dioxide is removed as by heating, or by diminished pressure as in mineral waters, or by consumption by organisms, calcium carbonate is precipitated. These facts, as well as the temporary hardness of water, and boiler incrustation, find explanation in the supposed union of carbonic acid with calcium carbonate to form calcium bicarbonate, a compound unknown in the solid state on account of the large dissociation pressure of carbon dioxide at ordinary temperatures.

Calcium Carbide, CaC_2, is a hard, opaque solid, white when pure, ordinarily brownish or grayish, obtained by heating coke and lime to a high temperature. The commercial product smells of hydrogen phosphide, due to impurities. Specific gravity, 2.22.

Calcium carbide reacts readily

with water, forming acetylene and calcium hydroxide—1 pound yielding about 6 cubic feet. It is used in the generation of acetylene (see ACETYLENE), and the manufacture of calcium cyanamide (see below).

Calcium Carbonate, $CaCO_3$, a white crystalline solid, occurs as Limestone, forming whole mountains and strata of vast extent, Marble, Calcite, Aragonite, Stalactites, Stalagmites, Chalk, Shells, Coral, and Pearls. It is insoluble in water, but dissolves in water charged with carbon dioxide (q.v.). Specific gravity, 2.7–2.9. Calcium carbonate heated yields carbon dioxide and calcium oxide; this is the basis of lime burning. It reacts with acids readily, often with effervescence, yielding carbon dioxide, water, and the calcium salt of the acid. It is used as building material; in making lime, cement, glass, sodium carbonate; as a flux in metallurgical operations; as whiting; and in putty.

Calcium Chloride, $CaCl_2$, a white, deliquescent solid, is a by-product of several commercial processes, as the Solvay soda process. Specific gravity, 2.15. Solubility: 100 c.c. of water (20° c.) dissolve 74.5 grams. The crystallized form, $CaCl_2.6H_2O$, dissolved in water produces a temperature of —48° c. It is used in refrigerating solutions; freezing mixtures; to mitigate dusty roads; and when incompletely dehydrated, as a desiccating agent.

Calcium Cyanamide, CaNCN, a dark gray compound, is made by strongly heating calcium carbide and nitrogen, as in the electric furnace. It reacts with water to form calcium carbonate and ammonia. It is used as a fertilizer; in the preparation of ammonium compounds, sodium cyanide, dicyandiamide, artificial urea, guanidine, and some explosives; and in case-hardening steel.

Calcium Fluoride, CaF_2, occurs as fluorspar, colorless and transparent when pure, and insoluble. Specific gravity, 3.16. It is easily fused; does not act upon other substances easily, and therefore serves in metallurgical processes as a liquid medium in which reactions take place at high temperatures; and facilitates the formation of slags. It is the source of fluorine compounds—*e.g.*, hydrofluoric acid, used in etching.

Calcium Hydroxide, $Ca(OH)_2$, a white solid, of which slaked lime is an impure form, is made by allowing calcium oxide, as quicklime, to react with water, thus slaking it. Specific gravity, 2.08. Solubility: 100 c.c. of water (18° c.) dissolve 0.167 gram, the solubility decreasing with rising temperature. The solution is lime water; milk of lime is a suspension in water.

Calcium hydroxide can be dehydrated by heating. It has an alkaline reaction with vegetable colors—*e.g.*, turning litmus blue—and is the cheapest strong base, neutralizing acids, forming the calcium salt of the acid and water. When carbon dioxide (gas) is bubbled through lime water a white precipitate of calcium carbonate forms. This reaction serves as a test for carbon dioxide. It is used in the making of mortar and whitewash; in the manufacture of alkalies and bleaching powder; removal of hair from hides in tanning; purification of illuminating gas and beet sugar; softening water; and in medicine.

Calcium Hypochlorite, $Ca(ClO)_2$, the calcium salt of hypochlorous acid, is unstable, decomposing into calcium chloride and oxygen. (See BLEACHING POWDER.)

Calcium Nitrate, $Ca(NO_3)_2.4H_2O$, a colorless, crystalline, deliquescent, salt, is found in small quantities in the soil. Specific gravity, 1.82. It is formed through the action of nitrifying bacteria, sometimes abundantly as in the neighborhood of cow houses. It is readily taken up by plants. A basic salt, not deliquescent, is preferred as a fertilizer. (See NITROGEN, FIXATION OF.)

Calcium Oxde, CaO, Lime or Quicklime, is an amorphous solid, white when pure, made by decomposing calcium carbonate, as limestone, by heating. It reacts with water, slaking, and forming calcium hydroxide or slaked lime. Specific gravity, 3.1–3.4. Solubility: 100 c.c. of water (20° c.) dissolve 0.125 gram. Melting point above 3,000° c. It is used in the making of mortar; glass; calcium carbide; as heat-resisting material; and in the limelight (q.v.).

Calcium Phosphate, $Ca_3.(PO_4)_2$, the tricalcium salt of orthophosphoric acid, is a white, insoluble solid occurring as phosphorite and in guano. (See APATITE.) It is the principal mineral constituent of bones, and of bone ash (83 per cent.). Basic slag, a product of iron smelting, consists largely of calcium phosphate. Specific gravity, 3.18. Soluble in dilute acids. Calcium phosphate and sulphuric acid yield an acid calcium phosphate, $CaH_4(PO_4)_2$, soluble in water, and the chief constituent of 'superphosphate' fertilizers. It is used in the preparation of fertilizers, phosphorus, phosphoric acid.

Calcium Sulphate, $CaSO_4.2H_2O$, the calcium salt of sulphuric acid, occurs widely distributed as gypsum, also as anhydrite, $CaSO_4$, and as alabaster, a granular form. It contributes to the permanent hardness of many natural waters, and is in sea water. Specific gravity, 2.96. Solubility: 100 c.c. of water (18° c.) dissolve 0.20 gram. It is used as fertilizer (land plaster); the material of plaster of Paris, kalsomine, and crayon; and in paper making.

Calcium Sulphide, CaS, a yellowish gray substance, is a by-product of the LeBlanc soda process. Specific gravity, 2.8. Some specimens, after being illuminated, shine for some time (phosphorescence), due to the presence of minute quantities of vanadium and bismuth as impurities. Calcium sulphide oxidizes in moist air, polysulphides and the thiosulphate forming. It reacts with warm water, forming calcium hydroxide and hydrosulphide. It is used in luminous paint, and as a depilatory.

Calc-sinter, or CALCAREOUS TUFA, consists of carbonate of lime, and is a deposition from springs, streams, or underground water, from which it is precipitated partly by the escape of carbonic acid which acts as a solvent, and partly by evaporation of the water. It is usually white, creamy white, yellowish, or brownish in color, but other hues occur, and variegated and mottled varieties are not uncommon. It is of variable texture and consistency, some kinds being rather soft, brittle, and friable, and porous or cellular. The so-called 'petrifying springs' of Matlock, England, afford a good example of the formation of calcareous tufa. Along the River Anio, at Tivoli, near Rome, calcareous tufa occurs in masses many feet in thickness, and under the name of *travertine* (see TRAVERTINE) is used as a building stone at Rome. Calcareous tufa is abundantly deposited from thermal springs, as in the Yellowstone Region of North America. The calcareous incrustations so commonly seen in caverns in limestone rocks are varieties of calcareous tufa, and are known as *stalactites* and *stalagmites* (qq.v.).

Calculating Machines are largely used at the present time both to simplify the work of arithmetical calculation and to obtain accuracy of result. In the construction of mathematical and astronomical tables and the tabulation of functions they are the only means of producing perfectly reliable results; and they are also in general use in insurance, financial, and commercial houses. They vary in construction from the simple Slide Rule (q.v.) to complex cash registers and electric tabulators.

The first machine to directly

perform the operations of addition and subtraction was that invented by Pascal in 1642, and known as the *machine arithmétique*. Twenty years later, Leibniz attempted the construction of a machine for making elaborate astronomical calculations; and various other attempts were made in succeeding years, but with little success. Between 1822 and 1842 Charles Babbage (q.v.) designed his machine for calculating mathematical tables by the method of 'differences.' About 1850 Thomas of Colmar invented a successful calculating machine known as the Arithmometer, in which the numbers were inscribed on cylinders moved by trains of toothed wheels.

The elements of nearly all ordinary calculating machines are cylindrical discs, on the surface of which are placed the figures 0 1 2. . . . 9. These discs are so connected that when a number disc is rotated ten places, the number disc of the next order moves one place. This suffices for addition. For subtraction, the discs are rotated in the reverse direction. Multiplication and division, the extraction of the square root, etc., are also performed by these machines. The motion of the discs was formerly produced directly by the hand; now a lever is employed. The use of keys for setting the sums to be worked has resulted in speed and accuracy of movement.

Probably the most useful modern business machine is a combination of typewriter and calculating machine. It registers columns of dollars and cents corresponding to the keys struck, and by the motion of a lever prints them on paper. The pressure of a special key, combined with the operation of the lever, causes the total to be printed in proper position below the column added up. The Burroughs Adding Machine is one of the best known of this type. In many of these machines the mechanism is operated by an electric motor, and increased ease and speed of operation are thus obtained. Other machines add, but do not record the items during the process, such as Felt's Comptometer. During recent years a large number of machines for calculating have been devised. In the main, they can be divided into two classes, as they follow the Burroughs or Felt type.

Among the more specialized calculators are *Curvometers*, which measure the length of curves on roads or maps; *Planimeters*, which determine by mechanical means the area of any figure; *Integrators*, which evaluate a definite integral; and *Harmonic Analyzers*, which determine the integrals of a curve with remarkable accuracy.

Cash Registers are a form of calculating machine which have come into almost universal use in retail establishments. The first practical machine of this kind was patented in 1879 by James Ritty of Ohio; many improvements have since been added. In the National Cash Register Company's 'detail adders,' the mechanism is operated by pressing registering keys, each of which is connected with a corresponding adding wheel inside the register, which shows the total amount of registrations made on that key.

In the electric tabulating machine used for recording and summarizing the United States Census returns, a keyboard of 240 characters perforates cards corresponding to the facts to be recorded; the perforated cards are fed into the machine; sorting boxes secure a combination of the facts recorded; and by means of electric connections the record is made. Similar machines have been adopted by many large business houses for cost keeping.

Cal′culus, or Stone (in medicine), a hard concretion formed within the animal body, in consequence of the deposition in the solid form of matters which usually remain in solution. The commonest are Biliary, Urinary, and Salivary Calculi, all of which may block the different ducts, and thus stop the flow of the secretion. The disorders caused by the passage or the impaction of a calculus, such as biliousness or hydronephrosis, result from the accumulation of secretion behind it, or from the irritation of the passage along which it is forced. For the treatment of Biliary Calculus, see Gall Stones; for that of Urinary Calculus, see Urinary Calculus.

The general course of procedure is to lessen the pain of the passage of a calculus by hot fomentations and baths, and by the administration of morphia or some other narcotic. Belladonna is another favorite drug. When a calculus is causing trouble by impaction, it is removed by operation. See Lithotomy.

Calculus, Differential and Integral, also called the Infinitesimal Calculus, is the mathematical method which enables us to deal with quantities which are in process of change or growth—*varying quantities,* as they are called. The height of a child, the distance of a train from the last station passed, the speed of a ball as it passes through the air, the population of a country, are examples of varying quantities. As a consistent method capable of general application, the calculus was first clearly formulated by Newton. Leibniz developed practically the same method a little later, and invented a notation which proved more suitable than Newton's for most purposes. This notation has been long in general use; but within the last fifty years writers on the differential and integral calculus have returned to Newton's method of laying the foundations of the calculus. In some of the higher applications, and especially in dynamical problems, Newton's notation is used with great advantage in association with that of Leibniz.

The ancients had no difficulty in measuring the area of figures (*e.g.*, fields) whose boundaries were built up of straight lines; but when the boundaries were partly curvilinear, the ordinary methods of geometry failed. It was soon recognized, however, that an approximate result sufficiently accurate for practical purposes could be obtained by regarding the curved line as polygonal—*i.e.*, as consisting of a great many very short straight lines meeting in a succession of points situated on the curve. The area of this polygonal figure could then be estimated by ordinary geometrical methods; and the greater the number and the shorter the individual lengths of the little straight lines, the more nearly did the result approximate to the true area of the original figure. It is in exactly this way that the mileage on a curved railway track is measured. The line is said to be curved, but the individual rails, which by being laid end to end give the curved track, are themselves straight.

In like manner, the mathematician, in estimating the length of a portion of a given curve, first imagines the curve constructed of *infinitesimal—i.e.*, excessively short—straight line bits, or 'elements,' as he calls them. He then forms their sum, and finds that as the elements are taken shorter and shorter, and therefore in greater and greater number, this sum gets nearer and nearer to a particular limiting value. It is this limit that measures the length of the arc. This process of summation is technically called *integration*, and the sum estimated in this way is called the *integral.*

The method just indicated is fundamentally identical with the method of exhaustions as practised by Archimedes and his successors, and greatly extended by Kepler (1615), and the method of indivisibles (Cavalieri, 1635; Wallis, 1655). Thus, historically, it was the integral calculus which first received partial development. The fundamental notions underlying it are, however, those of the other branch of the subject—the differential calculus, or calculus of small differences or infinitesimal increments.

Consider, for example, a curve being traced out by a moving point—say, the point of contact of one of the wheels of an engine as it moves along a curved railway track. At any instant this point is moving in the direction of the tangent to the curve at the position momentarily occupied, and the direction is measured as that of the infinitesimal element described in an excessively short interval of time. The position of the moving point is a definite quantity, being measured along the curve by the distance from a chosen fixed point. This position is changing at a definite rate, known as the speed or velocity of the moving point. The conception of this rate of change or *fluxion* of the position is a perfectly familiar one; its measurement is accomplished by dividing the short space described in a short but finite period of time by the measure of this period, and then considering what this ratio becomes as the corresponding changes in space and time are taken smaller and smaller, until, in short, they become infinitesimals. Thus, the velocity is the fluxion of the arc which has been described up to that instant; and the arc is regarded as a *fluent* quantity, which may be obtained from the fluxion by a reverse process, the same process which we have already called integration.

As the point continues to describe the curve, the direction of motion is constantly changing, the direction at the beginning of any arc, large or small, being different from the direction at the end of the arc. When the curve is highly curved, this change of direction in a given length—say, one foot of the arc—is considerable, and becomes smaller if the arc is less curved. Now, the direction of the element at any point is a property of the curve; and it is a property which must change at a particular rate as the moving point travels along. In short, it has a fluxion just as truly as the length of arc has a fluxion; and the ratio of the fluxion of the direction, or *angular velocity*, to the fluxion of the arc described, or *linear velocity*, is the mathematical measurement of the curvature of the curve.

In this illustration we have taken time to be the quantity in terms of which the rates of change of other quantities are expressed. But that is not essential. For example, in measuring the curvature of a curve, we really take the arc to be the so-called independent variable, and the change of direction of the tangent is then a function of the arc. Its rate of change per unit length of arc, or (to put it technically) its differential coefficient with regard to the arc, measures the curvature. When we know the rates of change, we are able, by aid of the methods of the integral calculus, to find the integral quantities, either quite accurately, or more or less approximately. It is always possible to differentiate an algebraic expression—*i.e.*, to find its rate of change in terms of the rates of change of the variable quantities involved; but to integrate a given expression—*i.e.*, to pass to the quantity of which it is the fluxion or differential coefficient—is possible in comparatively few simple cases. Every such integration involves the solution of what is known as a *differential equation*, involving not only the variable quantities themselves, but also their rates of change of the first and higher orders.

The importance of the infinitesimal calculus arises from the fact that all physical quantities are in a state of flux, and that it is impossible to discuss thoroughly their interrelations without taking full account of the laws governing the rates of change, and even the rates of change of these first rates of change themselves. It was in the attempts to get exact mathematical representations of the motions of the heavenly bodies, of the curve of equilibrium of a hanging cord, of the vibrations of a stretched string or drumhead, of the waves on water, of the flexure of a bar, and so on—it was in such attempts, in some instances only partially successful, that the immediate successors of Newton and Leibniz rapidly developed the method, which in these later times, in the hands of the pure mathematician, has been extended far beyond the demands of practical life. And yet there are many familiar phenomena which are only partially amenable to its methods as developed—*e.g.*, the spinning of a boy's top.

See FUNCTION; VARIATIONS, CALCULUS OF.

Consult Byerly's *Elements of Differential Calculus* and *Elements of Integral Calculus;* Perry's *Calculus for Engineers;* Campbell's *The Elements of Differential and Integral Calculus* (1904); Osborne's *Differential and Integral Calculus* (1907); Osgood's *Differential and Integral Calculus* (1908); Granville's *Differential and Integral Calculus* (1911); Davis and Brenke's *The Calculus* (edited by Hedrick, 1912); Wilson's *Advanced Calculus* (1912).

Calcut'ta, former capital of British India, chief city and capital of the province of Bengal, is situated on the east bank of the Hugli River (one of the many mouths of the Ganges), about 80 miles from the sea, in latitude 22° 35′ N., and longitude 88° 27′ E. The city extends for nearly 5 miles along the river, covering an area of about 7 square miles, and is from 16 to 18 feet above sea level. The average annual temperature is 77.9° F.; the average for the hot season, 83.3° F.; for the cold season, 68.3° F. The average annual rainfall is about 60 inches.

The city of Calcutta is divided into two sections, the northern or native city and the southern. Fort William, the largest fort in India, garrisoned by European and native soldiers, forms the nucleus of southern Calcutta. It is situated in a fine park known as the *Maidan*, which extends for 1¾ miles along the river, and which, with its beautiful drives and avenues, constitutes one of the features of the city. Facing the Maidan on the east and north are many fine residences and imposing public buildings; while on the west, extending northward along the river bank for over 2 miles, is the Strand, lined with a splendid series of jetties for ocean steamers. Attractive squares and gardens adorn the city, and broad streets connect it with its suburbs, which lie outside the native town.

There are many handsome public buildings in Calcutta—Government House, the former residence of the viceroy of India, being one of the finest palaces in the world. The principal churches are St. John's, for thirty-two years the cathedral of the diocese, and St. Paul's, the present cathedral. There are also a Roman Catholic cathedral, and numerous other places of worship. The most important Hindu shrine is that of the goddess Kali, at Kalighat, south of Calcutta. In the city itself the chief temple is 'Muddim Mohunjee,' where thousands worship daily.

Among the educational institutions are Calcutta University, an examining institution modelled upon the University of London; the government Presidency College, Sanskrit College, St. Xavier's College, Bishop's College for Christian natives, the government Engineering College, Medical College, College for Commercial Education, and School of Arts. There is an Imperial Museum, containing a splendid archæological collection, and an Imperial Library.

On the opposite bank of the river, and connected with Calcutta by a floating bridge, is

Howrah, containing the government warehouses, large ironworks and timber yards, a number of the principal jute mills, and the great terminus of the East Indian Railroad, as well as the Royal Botanical Gardens.

Calcutta may be regarded as the great commercial centre of Asia. The river, adjacent to the city, varies in breadth from a quarter of a mile to nearly a mile; and ships of 5,000 tons ascend to Calcutta in the usual course, the main difficulty to shipping being the James and Mary shoal, half way down the river. The principal docks are in the suburb of Kidderpur. In recent years these have been extended so as to give nearly 10 miles of quay frontage, and the navigation of the Hugli has been greatly improved.

The total value of merchandise and treasure imported in 1912–13 was over $200,000,000, while the value of exports exceeded $300,000,000. The principal items of export are tea, jute (raw and manufactured), hides, opium, oil seeds, rice, indigo, lac, and wheat. As a great central depot for the richest parts of India, including the Ganges Valley and Assam, the city has also an extensive inland trade.

The municipal administration of the city is vested, since 1899, in a corporation composed of Europeans and natives, about seventy-five in number, who, however, delegate their powers in great part to a special committee of twelve. The bulk of the inhabitants are Hindus, but there is a large Mohammedan population and a small percentage of Christians. In 1911 the population of the city proper was 896,067, as compared with 847,796 in 1901. Including the suburbs and Howrah, the population in 1911 was 1,222,313.

History. — Calcutta was founded by Governor Charnock in 1686, by the removal hither of the factories of the East India Company. In 1700 three villages surrounding the factories were conferred upon the company by the Emperor Aurungzebe, and forthwith fortified. In 1707 Calcutta had acquired some importance as a town, and was made the seat of a presidency.

In 1756, however, it was unexpectedly attacked by Suráj-ud-Daulá (Surajah Dowlah), the nawab of Bengal, and yielding after a two days' siege, was the scene of the tragedy of the 'Black Hole.' The nawab caused the whole of the prisoners taken, 146 in number, to be confined in an apartment 18 feet square. This cell had only two small windows, and these were obstructed by a veranda. The crush of the unhappy sufferers was dreadful; and after a night of excruciating agony from pressure, heat, thirst, and want of air, there were in the morning only 23 survivors. The city remained in the hands of the enemy until seven months afterward, when Clive and Admiral Watson recaptured it, and concluded a peace with the nawab.

In 1772 Calcutta superseded Murshidabad as seat of the central government in India, and remained the capital of British India until 1911, when the government was removed to Delhi. Consult Cotton's *Calcutta Old and New* (1907).

Caldecott, kôl′d*e*-kut, Randolph (1846–86), English artist, was born in Chester. He contributed frequently to *Punch* and *The Graphic;* and in 1882 he became a member of the Institute of Painters in Water Colors. He was without an equal as a draughtsman, and exponent of the humors and joys of the country house and hunting field. His picture books for children are inimitable in their subtle humor and in the quaint, tender insight which they give into human and animal nature. *Caldecott's Picture Books* began in 1878 with *John Gilpin* and *The House That Jack Built*, and ended the year before his death with the *Elegy on Madam Blaize* and *The Great Panjandrum Himself.* He also illustrated Washington Irving's *Old Christmas* and *Bracebridge Hall*, Mrs. Comyns Carr's *North Italian Folk*, Blackburn's *Breton Folk*, and Mrs. Ewing's *Daddy Darwin's Dovecote* and *Jackanapes.* He died in St. Augustine, Fla.

Calder, Sir Robert (1745–1818), English admiral, took part in the battle of Cape St. Vincent in 1797 as first captain to Sir John Jervis. Previous to Trafalgar, when in command off Ferrol, he engaged a much superior force of French and Spanish ships, part of the fleet which had been chased by Nelson from the West Indies back to Europe, and captured two ships of the line. Public opinion, however, was not satisfied that he had done his utmost. He was consequently tried, convicted of an error of judgment, and severely reprimanded. He became a full admiral in 1810.

Caldera, käl-dā′rä, a large basin-like depression of volcanic origin—an extinct crater. These are sometimes extensive and well preserved and occupied by lakes, thus giving the remarkable phenomenon of a lake occupying the whole summit of a mountain. A famous example is Crater Lake, Oregon, which is 5 miles in diameter and 4,000 feet deep.

Calderon, *Fr.* kȧl-dā-rôṅ′, Philip Hermogenes (1833–98), Anglo-French painter of Spanish parentage, was born in Poitiers. From 1853 he was a regular contributor to the Royal Academy, of which he became an Associate in 1864, and an Academician in 1867. His earlier works were directly historical, but latterly he worked in almost every department of painting. His works include: *Renunciation of St. Elizabeth of Hungary* (National Gallery, London); *The Proposal; The Jailer's Daughter; Widow and Orphans at the Funeral; Aphrodite.*

Calderon de la Barca, *Sp.* käl-dā-rōn′ dā lä bär′kä, Pedro (1600–81), Spanish poet and dramatist, was born in Madrid. Although he is said to have written a play at the age of thirteen, he first became publicly known as a dramatist at the age of twenty. He appears to have served as a soldier in Italy and elsewhere from about 1623 to 1629; and on his return to Madrid, at the latter date, he at once became famous in the theatrical and poetic court of Philip IV. for his comedies and sacred plays. For the next ten years he produced a vast number of dramas, sacred and profane. Though more than one story exists of his early turbulence, he decided to become a priest, and was ordained in 1651. Ecclesiastical preferments were heaped upon him, and he became one of Philip's chaplains in 1663, dying as superior of the Congregation of San Pedro in 1681.

The reign of Philip IV. was the golden age of the Spanish theatre. Already Lope de Vega had turned into facile verse the romantic, chivalrous mysticism that was the keynote of the national character; but Calderon brought to them a nobler moral ideal than that furnished by the stories of lascivious intrigue which had formed the main stock of his predecessors. The profoundest thought, the most elevated of moral sentiments, were clothed by him in words so chaste and eloquent as to reach the understanding of the peasant as easily as they touched the intelligence of princes and ecclesiastics. In ingenuity and invention far inferior to Lope, Calderon surpassed him in profundity and grace.

His most famous secular dramas are *El Mágico Prodigioso, La Vida es Sueño, El Principe Constante*, and *El Alcalde de Zalamea.* The first of these is somewhat reminiscent of *Faust*, with a different ending. The best known of Calderon's plays in England, after *El Mágico Prodigioso*, is *La Vida es Sueño* ('Life is a Dream'). It is, however, in his sacred plays (*autos*) that Calderon stands absolutely supreme, and a fine specimen of this species of drama may be seen in MacCarthy's English version of Calderon's *Encantos de la Culpa* ('The Sorceries of Sin'). MacColl has also translated *The Select Plays of Calderon* (1888); and Fitzgerald's (1877) and MacCarthy's (1873) versions of the *Mágico Prodigioso* and other dramas may be recommended, as well as *Six Plays by Calderon*, ed. Dr. Oelson (1903). The Calderon literature is very large, especially in Germany, where Calderon is placed by some authorities above Shakespeare. See Schack's *Geschichte der Dramatischen Literatur in Spanien* (1854-5); Menendez y Pelayo's *Calderon y su Teatro;* Archbishop Trench's *Calderon* (1880); Miss Hassell's monograph on the same subject (1879); Juan Eugenio Hartzenbusch's 'Obras de Calderon,' occupying vols. vii., ix., xii., and xiv. of the *Biblioteca de Autores Españoles* (1848-52).

Calderwood, David (1575-1650), Scottish ecclesiastic and historian, was born at Dalkeith, Midlothian. He opposed the introduction of prelacy, and in 1617 was deprived of his charge, imprisoned, and banished. He went to Holland, where, in 1621, he published *The Altar of Damascus*, a defence of Presbyterianism, and a Latin version of it in 1623. After his return to Scotland in 1625, he assisted in drawing up the *Directory for Public Worship*, and wrote his celebrated *Hist. of the Kirk of Scotland* (1678). See T. Thomson's 'Life of Calderwood' in Woodrow's edition of his *History* (1849); Walker's *Scottish Theology and Theologians* (1887).

Calderwood, Henry (1830-97), Scottish philosopher, born at Peebles; ordained a minister of the United Presbyterian Church (1856); became professor of moral philosophy in Edinburgh University (1868), and chairman of the first school board of that city (1873-7). His chief works are, *The Philosophy of the Infinite* (1854), *Handbook of Moral Philosophy* (1872; 14th ed. 1888), *Relations of Mind and Brain* (1879; 3rd ed. 1892), and *Evolution and Man's Place in Nature* (1893). See *Life* by his son (1900).

Caldicott, Alfred James (1842-97), English musician, was born at Worcester; studied under Moscheles, Reinecke, and Hauptmann at Leipzig; was organist at St. Stephen's, Worcester (1865-82); professor at Royal College of Music in 1882 and Guildhall School of Music (1890-2); and became conductor of the Comedy Theatre, London (1893). He composed the glee *Humpty Dumpty* (1878), *Winter Days* (1879), and the oratorio *The Widow of Nain* (1893).

Caldwell. See George, Lake.

Caldwell, Howard Walter (1858), American historian, born at Bryan, Ohio. He removed to Nebraska in 1874, graduated at the University of Nebraska in 1880, and later became professor of American history and jurisprudence there. Among his publications are a *History of the United States*, 1815-61 (1896); *Studies in History* (1897); *Some Great American Legislators* (1899); *Life of Henry Clay* (1899); *Expansion of the United States* (1900).

Caleb, the son of Jephunneh, was one of the spies sent by Moses to explore the land of Canaan. Num. ch. 13 and 14, which relate the incident, are a crucial instance of the composite structure of the Hexateuch. Thus, in ch. 14 : 24 Caleb alone dissents from the timid report of his companions; while in ver. 6 and 30 Joshua is mentioned as his comrade in the advocacy of an immediate advance, and is associated with him in being the only survivors of the original exodus from Egypt who were privileged to enter the Promised Land. After the settlement, Hebron and its district were assigned to Caleb. See Commentaries on Numbers.

Caledonia. See Scotland.

Caledonian Canal, waterway, partly natural, partly artificial, through the picturesque Glenmore, Inverness-shire, Scotland, connecting the Atlantic Ocean with the Moray Firth branch of the North Sea. It consists of Lochs Lochy, Oich, Ness, and Dochfour, united by 23 m. of cuttings. It is chiefly used by the fishing fleets, and by small steamers which afford tourists easy access to Fort William for Glen Nevis and Ben Nevis, Fall of Foyers on Loch Ness, etc. James Watt made a survey in 1773, but work was not begun till after Telford and Jessop made their estimate of $2,309,305 in 1803. In 1822, when two-thirds finished, the canal was opened for navigation, and was completed in 1847. Total length, including lochs, 60½ m.; depth, at standard level, 17 ft.; breadth at surface 100 ft., at bottom 50 ft. The total cost up to May, 1849, was $6,381,294. The canal is under the control of a government commission, and is worked at a small annual loss.

Calendar. The Roman calendar of Julius Cæsar was based on the solar year, which was assumed to be 365¼ days long. As at present, the quarter-day was accounted for by the insertion of an additional day every fourth year (leap year); and the names of the months, and the number of the days in each, were the same, after a few small alterations had been made by Augustus, as they are in a modern European calendar. The Julian solar calendar was defective, because it made the year more than eleven minutes too long. On the introduction of Christianity, some method of fixing the date of Easter, on which that of many other festivals of the church depended, became necessary. Much difference of opinion prevailed, and the Eastern churches commemorated our Lord's death on the fourteenth day of the moon after the spring equinox, and kept Easter two days later; while the Western churches celebrated Easter on the Sunday following the fourteenth day of the moon. The sect called Quartodecimans commemorated only the death of Christ, on the fourteenth day, the day of the Jewish Passover. At length, in A.D. 325, it was decided, at the Council of Nicæa, that Easter should be held on the first Sunday after the fourteenth day of the moon that occurred next after the vernal equinox, and that if the fourteenth day of the moon fell on the day of the equinox, the following Sunday should be Easter day. It was also declared that, in finding Easter, the vernal equinox should be considered to fall every year on March 21. Now the length of a lunation is very variable, and cannot be used in combination with the length of a solar year. It was therefore necessary to adopt a fictitious or calendar moon, of which a certain number of lunations would be equal in length to some number of solar years. Thus cycles were formed in which the dates of Easter recurred in the same order. It was not, however, till A.D. 533 that a scheme was propounded which found favor with the majority of churchmen. Victorious, bishop of Aquitaine, had brought into notice a period formed by a cycle of 28 solar years, combined with the lunar cycle of 19 years introduced into Athens by Meton. Meton made 235 mean lunations equivalent to 19 solar years of about 365¼ days each, or 6,940 days. In the Calippic cycle of 76 years this number was reduced to 6,939¾. In the Victorian cycle each year contained twelve ordinary lunations of 30 and 29 days alternately which together accounted for 354 days. The eleven remaining days of the year were carried forward till, at the end of three years, they amounted to 33 days, 30 of which were taken to form an embolismic or intercalary month; while the remainder, amounting in 18 years to 18 days, together with the 11 days of the 19th year, formed a seventh embolismic month of only 29 days. If the above be added up, it will be found that 4¾ days are needed to make up the number 6,939¾. These are the days inserted in the leap years, and are common to both lunar and solar years. The seven letters A to G are placed beside the days of the months in the calendar, A being affixed to Jan. 1, and the whole seven recurring in regular order to the end of the year. Their number being seven, the same letter always recurs on the same day of the week. The length of the periods in which the dates of the Sundays occur in the same sequence is 28 years (4 × 7). This cycle, combined with the lunar cycle of 19 years, forms the Victorian period of 532 (28 × 19) years, in which the dates of Easter Sunday follow an invariable order. In A.D. 533, Dionysius Exiguus, a Scythian monk, adopted the Victorian period, and fixed for it certain starting-points. For the era of his reckoning he took the birth of Christ, which he calculated to have taken place in A.U.C. 753. The following year therefore became A.D. 1; and though there is reason to suppose that Christ was born three years earlier, the Dionysian era has been retained. He also decided that the dominical letter in A.D. 1 was B, and that the same year was the tenth of a solar cycle. The golden number—*i.e.* the number of the year of the lunar cycle—was 2 in A.D. 1. From these data the golden number and the Sunday letter for every year may be found. The calculation is usually effected by assigning certain numbers to the letters, those in the Book of Common Prayer being A = 0, G = 1, F = 2, etc. This method gives for leap year the second letter, used for finding Easter. To find the year of the lunar cycle, or the golden number, 1 is added to the number of the year, and the result divided by 19. The remainder is the golden number; but if there is no remainder, the golden number is 19. Accordingly, the golden number of 1265 is 12. A lunar cycle was reckoned by Alexandrian astronomers to begin on March 23, 323 A.D., the date of the vernal equinox in that year. Two months earlier (30 and 29 days), on Jan. 23, there would also be a new moon; and as the new moons are eleven days earlier every year, one would fall, in the third year of the cycle, on Jan. 1, 325, the year in which the Council of Nicæa was held—a fact which would also probably influence Dionysius in the choice of a starting-point. In the calendar the golden number was affixed to those days on which the new moons fell in that year of the cycle. It was therefore easy to find the fourteenth day of the moon that fell next after March 21, and the next day to which the Sunday letter of the year was affixed was Easter day. This calendar was known as the Perpetual Julian Calendar, and from it tables were compiled to find Easter 'for ever.' But the solar year is 11 m. 14 sec. less than 365¼ days, and 235 mean lunations are about 1 hour 29 minutes less than 19 Julian years. As centuries passed, the defects of the calendar became more and more apparent, the true equinox occurring before March 21, and the real new moons also preceding the calendar new moons. Accordingly, Pope Gregory XIII. determined to reform the calendar, and entrusted the work to a German Jesuit, Christopher Schlüssel, generally known by his Latinized name of Clavius, who carried out a scheme planned by Aloysius Lilius, a Neapolitan physician and astronomer. In 1581 the true equinox fell on March 11, or ten days before the equinox of the calendar. To rectify this error, Oct. 15, 1582, in which year the reformed calendar was introduced, was made to follow October 4, the intervening days being omitted. The true new moons preceded the calendar new moons by four days; but Clavius moved the latter only three days back, in the hope of preventing Easter from falling at any time on the day of the Passover. That the solar error might not arise again, he decided to make all centurial years which did not contain a number of centuries divisible by 4, ordinary years. Thus 1600 was a leap year, but 1700, 1800, and 1900 were ordinary years. The lunar error in the Metonic cycle amounts to about eight days in 2,500 years, and therefore a day was to be omitted at the expiration of each of seven periods of 300 years each, and then at the end of a period of 400 years. This correction was first applied in 1800, and will again be applied in 2100, 2400, 2700, etc. Small errors still remain; but as that of the solar year amounts to one day only in about 3,520 years, its mode of application has been left to posterity.

In compiling his calendar Clavius made use of epacts. The epact of any year is the age of the moon at the beginning of the year. If there is a new moon on Jan. 1, 11 days remain over at the end of the year after the twelve ordinary lunations of 30 and 29 days alternately have been counted off: 11 is, then, the epact of the second year, and 22 of the third. At the end of the third year 33 days have thus accumulated, of which 30 days constitute an embolismic month, and 3 are carried forward as the epact for the following year. In 325, the third year of a cycle, there was a new moon on January 1, and therefore the epact of the year would be 30, or 0, which Clavius indicated by ✱. Clavius put the new moons three days back, and the days of the solar year ten days, which would bring the new moon in the third year of the cycle to January 8, seven days later than in the old calendar. 1800 was an ordinary year, but in that year the lunar correction was applied, so that the relation of the solar and lunar years was not disturbed, and therefore the new moons are now only nine days later than in 325. The first new moon in the third year of the cycle is therefore on January 10 instead of on January 1, and the epact for the year is 21 (30 − 9). By adding 11 for each succeeding year, and rejecting 30 when it occurs, the following series will be obtained:—

Golden Numbers.—	I.	II.	III.	IV.	V.	VI.
Epacts.—	29.	10.	21.	2.	13.	24.

VII.	VIII.	IX.	X.	XI.	XII.	XIII.
5.	16.	27.	8.	19.	*.	11.

XIV.	XV.	XVI.	XVII.	XVIII.	XIX.
22.	3.	14.	25.	6.	17.

The last month of the cycle is the embolismic month of 29 days, so that the new moon of the next year is a day earlier than when found by the usual process. This is usually accounted for by adding 12 instead of 11 to the epact of the nineteenth year, and thus 29 is the epact for the first year of the succeeding cycle. The above series will remain in force till 2200, for 2000 will be a leap year, and in 2100 the lunar correction will again be applied. 2200 being the sixteenth year of the cycle, its epact will be 13, and the other epacts will be changed so as to form a new series. In the old calendar the new moons constantly returned to the same dates after the expiration of 19 years, and there were certain days on which a new moon could not fall, and to them no golden numbers were affixed. But under the new system every day of the year will in course of time become the first of a lunation, and must therefore have an epact attached to it. Clavius made his epacts recur throughout the year in descending order, beginning with ✱ on January 1, so that the epact showed the days on which the new moons occurred in the year of that epact. Consider the epact 27. The moon will be 30 days old on January 3, and a new moon will begin on January 4, to which the number 27 is affixed. In order to make the lunar months 30 and 29 days long alternately, the two epacts 25, XXVI. were printed opposite February 4, and XXV., XXIV. opposite February 5; and the same device was repeated in April, June, July, August, September, and November. The epact 25 was chosen for repetition in order that no two new moons in the same cycle might occur on the same day of the year. If all the thirty possible series of epacts be written out, it will be found that 24, 25, and 26 never occur together in the same series; that when 25 and 24 are in the same series, 25 is the epact of a year the golden number of which is greater than 11; and that when 25 and 26 are in the same series, 25 is the epact of a year below 11. Hence, if the golden number of the year exceeds 11, 25 must be taken; in other cases, XXV. The epacts down to XXV. following one another in their proper places in February, the first month in the corresponding years will have 30 days, the second 29, the third 30, and so on. But 25, 24, and all the epacts following, are moved up one place, so that in the corresponding years the first month has 29 days, the second 30, and so on.

To find Easter, the difference between the epact and 30 is taken, and to this are added 59 days for the first two months, and 14 more because Easter comes after the fourteenth day of the moon. March 21 is the eightieth day of the year, and if the above sum equals or exceeds 80, as it will when the epact is 23 or less, the difference gives the number of days by which the Paschal 'full' moon, as it is inaccurately called in the English Prayer Book, follows March 21. If it be less than 80, a third month must be added, of 30 days if the epact be XXV., 26, or higher, and of 29 if the epact be 25 or 24. The year 1902 is the third year of the cycle, and its epact is 21. To find the Paschal full moon, we have 9 + 59 + 14 = 82. The Paschal full moon is therefore on March 23. The Sunday letter of the year is E, and will be found in a calendar opposite March 23. According to the rule, then, Easter fell on the next Sunday (March 30). The accompanying table shows the days on which Easter falls during the 300 years ending 2199. Having found the golden number of the year and the Sunday letter, look in the table for the number in the same horizontal line as the G.N. of the year, and in the vertical column headed by the Sunday letter. This is the date of Easter, the name of the month being the one next on the left. It should always be remembered that the moon in this reckoning is a conventional moon, not the moon of the heavens, and that, consequently, Easter may fall on the day of the real full moon, the fourteenth day of the real moon, or, in spite of Clavius' precaution, on the day of the Jewish Passover.

The New Style, as the Gregorian system was called, was adopted in most of the Roman Catholic countries, and in Denmark and the Netherlands, in the year of its promulgation, 1582; by the Protestants of Germany and Switzerland in 1700 (Prussia in 1778); in Great Britain in 1752, when the eleven days between September 2 and 14 were omitted, and the beginning of the year moved from March 25 to January 1; and, lastly, in Ireland in 1782. The Dionysian calendar is still retained in the Balkan states and in Greece, while in Russia the New Style was adopted in 1902.

During the French revolution a new calendar was introduced. The first year, commencing on Sept. 22, 1792, was styled the first year of the republic. The year was divided into 12 months of 30 days each, and the five days over (Sept. 17 to 21) were celebrated as festivals dedicated to Virtue, Genius, Labor, Opinion, and Rewards respectively. The calendar, first used on Nov. 26, 1793, was discontinued on Dec. 31, 1805.

See YEAR; also MONTH; WEEK; DAY; EASTER; SEASONS.

Consult Clavius' *Operum Mathematicorum Tomus Quintus;* S. Butcher's *The Ecclesiastical Calendar*; Blaikie's *Monthly Star Maps for the Year* 1900, *with Notes on the Lunar-Solar Calendar*, etc.

Table for Ascertaining Date of Easter for 300 Years Ending 2199.

G.N.	A.	B.	C.	D.	E.	F.	G.
I.	Apr. 16	— 17	— 18	— 19	— 20	— 21	— 15
II.	" 9	— 10	— 4	— 5	— 6	— 7	— 8
III.	Mar. 26	— 27	— 28	— 29	— 30	— 24	— 25
IV.	Apr. 16	— 17	— 18	— 12	— 13	— 14	— 15
V.	" 2	— 3	— 4	— 5	— 6	— 7	— 1
VI.	" 23	— 24	— 25	— 19	— 20	— 21	— 22
VII.	" 9	— 10	— 1	— 12	— 13	— 14	— 15
VIII.	" 2	— 3	— 4	Mar. 29	— 30	— 31	Apr.
IX.	" 23	— 17	— 18	— 19	— 20	— 21	— 22
X.	" 9	— 10	— 11	— 12	— 6	— 7	— 8
XI.	Mar. 26	— 27	— 28	— 29	— 30	— 31	Apr. 1
XII.	Apr. 16	— 17	— 18	— 19	— 20	— 14	— 15
XIII.	" 9	— 3	— 4	— 5	— 6	— 7	— 8
XIV.	Mar. 26	— 27	— 28	— 29	— 23	— 24	— 25
XV.	Apr. 16	— 17	— 11	— 12	— 13	— 14	— 15
XVI.	" 2	— 3	— 4	— 5	— 6	Mar. 31	Apr. 1
XVII.	" 23	— 24	— 18	— 19	— 20	— 21	— 22
XVIII.	" 9	— 10	— 11	— 12	— 13	— 14	— 8
XIX.	" 2	— 3	Mar. 28	— 29	— 30	— 31	Apr. 1

Calendering, the process of finishing by pressure the surface of linen, other textile fabrics, and paper. A calender consists of from three to twelve cylinders, called 'bowls,' one or more of which is of paper or cotton pressed into a solid mass by hydraulic pressure, while the rest are of steel, chilled cast iron, or brass. Between these the fabric is passed under heavy pressure.

Cal'ends (Lat. *Kalendæ*), the first day of each Roman month, which was divided into *calends*, *nones*, and *ides*. The calends always fell upon the first of the month; in March, May, July, and October, the nones on the 7th, and the ides on the 15th; and in the remaining months, the nones on the 5th, and the ides on the 13th.

Calendula. See MARIGOLD.

Calepino, kä-lā-pē'nō, or DA CALEPIO, AMBROGIO (1435–1511), Italian lexicographer, and an Augustinian monk, was a native of Bergamo. He devoted his life to the compilation of a polyglot dictionary, first published at Reggio in 1502. The best edition is that of Facciolati (Padua, 1718).

Cal'gary, city, Alberta, Canada, the largest and most important city between Winnipeg and Vancouver, is situated at the junction of the Bow and Elbow Rivers, on the main line of the Canadian Pacific Railroad; 2,262 miles west of Montreal. It occupies a beautiful site (40½ square miles) at the entrance to the foothills of the Rocky Mountains, and is laid out with broad, well-paved thoroughfares and a park system including 10 public parks, covering almost 600 acres, and including a municipal golf course. Interesting features are the City Hall, completed in 1911; the Provincial Normal School; public library; Canadian Government elevator; the high-level concrete bridge; several schools and hospitals.

Calgary is situated in the heart of one of the richest agricultural and stock raising regions of Canada and has a considerable trade, especially in livestock and grain. There are also valuable deposits of iron, lead, coal, oil, silicate, sandstone, and clay in the neighborhood. Manufactures include the large repair shops of the Canadian Pacific, lumber mills, iron and metal works, brick and cement works, meat packing establishments, soap works, and flour mills. The city government is of the combined commission and council form, with the mayor and two commissioners as the executive, and 12 aldermen as the legislative body. The initiative, referendum, and recall are in operation, and municipal ownership of public utilities is an important feature. Calgary was incoporated as a town in 1884 and as a city in 1894. It is a station of the Royal Northwest Mounted Police and a Hudson's Bay Post, and is the headquarters of the largest irrigation project in America and the second largest in the world. Pop. (1911) 43,736; (1916) 56,302.

Calhoun, kal-hōōn', JOHN CALDWELL (1782–1850), American statesman, was born, of Scotch-Irish descent, in Abbeville District, S. C., on March 18, 1782. He was reared on a farm, studied at Yale, graduating with high standing in 1804, and in 1804–7 studied law, in the famous law school at Litchfield, Conn., and at Charleston. He was admitted to the bar in 1807, but almost from the beginning devoted himself to politics. He served in the South Carolina legislature in 1808 and 1809, and from 1811 to 1817 was a Democratic representative in Congress. Like Henry Clay, he was an ardent supporter of the measures which led to the War of 1812 with Great Britain, and it was he who, as a member of the Committee on Foreign Relations, moved the formal declaration of war in the House. He advocated protection to American industries; favored a national bank; and urged the constitutionality of internal improvements to be made by the general government. In short, during this period his outlook was national rather than sectional; he was even, to some extent, a broad-constructionist in the interpretation of the Constitution, advocating measures and policies of which he was later to become the ablest and most thoroughgoing opponent.

From 1817 to 1825 Calhoun was Secretary of War in the cabinet of President Monroe, and as such showed conspicuous administrative talent; he reorganized and greatly increased the efficiency of the department; actively promoted internal improvements; and advocated an enlightened Indian policy. Showing himself more and more a national leader, he eagerly coveted the presidency now as for many years afterward, and strove for the nomination in 1824, but in this he was unsuccessful. He was, however, vice-president from 1825 to 1832, during the administration of John Quincy Adams and the first administration of Andrew Jackson. He incurred Jackson's strong personal displeasure, owing to his earlier denunciation of Jackson's high-handed course in the Seminole War (see JACKSON, ANDREW), and also to his opposition to Jackson's championship of Mrs. Eaton (see EATON, MARGARET), while the political views of the two men gradually came to differ irreconcilably.

It was during Jackson's first administration that Calhoun's views underwent a marked change. The immediate occasion of the change was the policy of the government which led to the nullification movement of 1832–3 in South Carolina; and it was he who, in the draft of the famous South Carolina Exposition of 1828, and particularly in his *Address to the People of South Carolina* (1831) and in his letter of Aug. 28, 1832, to Gov. Hamilton, provided his State and the South with probably the ablest exposition ever prepared, an exposition which has become classic, of the theory of nullification and of state sovereignty generally. To support these views and to fight for the cause of his state, he resigned the vice-presidency (Dec., 1832) and entered the U. S. Senate, in which he served, except in 1844–5, until his death. With all the intensity of his nature he advocated the most extreme form of States' rights and opposed any form of liberal construction of the Constitution. In the Senate he made himself the foremost champion of the South; he was pre-eminently the great constitutional thinker of his section; he, more than any other man, furnished the 'slaveocracy' with its arguments and determined the political course which it was to pursue. He defended slavery as a positive good and bitterly assailed the Abolitionists and their propaganda.

He opposed national banks and internal improvements as unconstitutional, fought protectionism and as Tyler's Secretary of State (1844–5), did more than any other man to secure the annexation of Texas. He opposed the Mexican War; denied the power of Congress to prohibit slavery in the territories, fought the Wilmot Proviso, and attacked the doctrine of squatter sovereignty; and, finally, though weakened by illness, opposed the compromise of 1850. He died on March 31, 1850.

Consult Calhoun's *Collected Works* (1853–4), and his *Correspondence*, ed. by J. F. Jameson; Von Holst's *John C. Calhoun;* Gaillard Hunt's *John C. Calhoun* (1908); H. T. Peck's *American Party Leaders* (1914).

Calhoun, WILLIAM JAMES (1848–1916), American diplomat, was born in Pittsburg, Pa. He was educated at the Union Seminary, Poland, O., was admitted to the bar in 1875, and practised his profession at Danville and Chicago, Ill. From 1898 to 1900 he was a member of the Interstate Commerce Commission; in 1905, special commissioner for the United States to Venezuela, and in 1909–13 minister to China.

Cali, kä-lē', city, department of Cauca, Colombia, on a tributary of the Rio Cauca, 3,300 feet above sea level; 50 miles southeast of Buenaventura. It has a considerable trade, quinine being an important article of export. Copper, coal, and iron are mined in the neighborhood. Pop. 16,000.

Calibo, kä-lē'vō, or CALIVO, Pueblo, Capiz province, Panay Island, Philippine Islands, on the Aclan River; 3 miles from the northern coast, 30 miles northwest of Capiz. Tobacco, rice, and maize are grown, woven fabrics are made, and fishing is carried on. Pop. 15,000.

Calibre, the technical term for the diameter of the bore of a firearm. See GUNS.

Calico Bass, or GRASS BASS, a small, mottled, sunfish-like bass (*Pomoxys sparoides*) of the Mississippi Valley and Great Lakes, closely related to the Crappie.

Calico Bush. See KALMIA.

Calico Printing, or the art of imprinting colored patterns on cotton cloth, is of very ancient origin. The Egyptians prepared printed fabrics, and the art seems to have been known in India, Persia, and China long before it was heard of in Europe. It was introduced into England about 1675. The design may be cut out on a block or blocks of wood, but is more commonly reproduced on copper rollers. The printing machine itself consists of a large central drum, around the circumference of which the engraved copper cylinders are arranged, one for each color to be printed. An equal number of cloth-covered wooden rollers carry the color from the color boxes to the cylinders. As the central drum revolves, the fabric to be printed is pressed between it and the cylinders, each of which leaves its impress. In the earliest machines but one color was printed at a time, but machines are now made to print as many as sixteen in a single operation.

To fix the dye upon the cotton fibre, a 'mordant' is required, which has the double property of adhering to the fibre and of forming an insoluble compound or 'lake,' with the dye (see MORDANTS). The methods used in printing are known technically as styles. In the madder style, where alizarin is used, the mordant is printed by means of the copper roller on the fabric; and if more than one color is required, several mordants are used. Acetate of aluminum and alizarin produce pink and red colors, acetate of iron and alizarin give purple and black, and the mixture of the two yields a chocolate. Tin salts produce an orange; and by mixing and varying the strength a great variety of colors is produced.

After the cloth is printed with the mordant it is 'aged' by passing it through a large chamber suitably heated and charged with moisture. The next process is that of 'dunging,' which formerly consisted of passing the cloth through hot water mixed with cow-dung, but is now effected by the use of chemicals such as sodium phosphate or arsenate. The object of these two processes is to decompose the acetate and precipitate the oxide of aluminium, iron, or tin on the fabrics. The cloth is then dipped in the alizarin, when the various shades of color appear, after which it is washed in soap and water to remove the dye from the unmordanted parts.

In another process, known as the pigment style, insoluble pigments, such as ultramarine, chrome, vermilion, etc., are mixed with a thickening paste and printed directly on the fabric, which is dried by passing over a hot roll.

The steam style, which has largely superseded the madder style, is employed for colors in which the mordant, dyestuff, and a thickening agent can be mixed cold or at a low temperature without the formation of a color lake. Tannic acid is commonly used as a mordant in this style, and the cloth is generally oiled slightly with 'oleine' before printing. The fabric is passed through a continuous steamer with the steam under 3 to 10 pounds pressure so that the acid vaporizes and a reaction is brought about between it and the dyestuff; the print is then washed in a soap bath to remove the thickening.

In the oxidation style, which is used chiefly for aniline blacks, the fabric is printed with a paste containing aniline salts, sodium or potassium chlorate, and vanadium salts, mixed with a suitable thickening agent, after which it is dried, passed through a potassium bichlorite solution and washed in a hot soap solution.

In the discharge style the dyed cloth is printed with a discharge paste, which destroys the color, leaving a white figure on a colored ground. Some color which is not affected by the discharge may be added to the paste and thus colored figures on a colored ground may be obtained. Stannous chloride, zinc dust, tartaric acid, and sodium bisulphite are common discharges.

In the resist style substances are printed on the cloth which render it impossible to fix the mordant or color in the printed parts, so that the pattern appears white on a colored ground.

A method of printing on cloth by a lithographic process is of recent invention.

Consult Knecht and Fothergill's *Principles and Practice of Textile Printing* (1912); Blackwood's *Calico Engraving* (1913); Thorpe's *Outlines of Industrial Chemistry* (1920).

Cal'icut, seaport, of Malabar, Madras presidency, India, 50 miles north of Cochin. In the centre of the town is the European quarter with a Roman Catholic and an English church, the remains of an old palace, and a new palace, the Custom House, and the Club. In the Brahman quarter is a large and interesting temple. A textile factory manufactures the cotton cloth called calico, originally exported from Calicut by the Portuguese. Calicut was the first place in India visited by Europeans. Covilhão, the Portuguese adventurer, landed here about 1486, and Vasco da Gama in 1498. In 1792 the port came into the possession of the British. Pop. (1911) 78,417.

Calif, kā'lif (Caliph), a Western form of the Arabic *khalifa*, 'a successor,' the title assumed and borne by the consecutive rulers of Islam, as 'successors' of their great prophet. Hence the term 'califate' or 'caliphate' became applied to this supreme office, and, in a wider sense, to the whole empire of the califs.

After the death of Mohammed (q. v.), in A.D. 632, his place as ruler and spiritual guide of Islam was at once filled by the father of his wife Ayesha, Abu-Bekr, who, by general consent and by the prophet's own choice, was recognized as better qualified than any other to be the first 'successor.'

Abu-Bekr's short reign (632–634) was marked by the extension of the bounds of Islam. Khalid, surnamed the 'Sword of Allah,' Abu-Bekr's greatest general, carried the Moslem warriors to victory again and again, in their battles with the Persians in the east, and against the Romans (636) under Heraclius in Syria. By the year 642 the conquest of Persia was complete; and as early as 638 Omar, Abu-Bekr's successor, had founded the two cities of Basra (Bussorah) and Kufa, in the Euphrates valley. Damascus, Antioch, and Jerusalem had all been surrendered by the Romans in 636, and Syria had become wholly Moslem two years later. The conquest of Egypt, begun in 640, was achieved in the following year. Thus, when Omar perished by the hand of an assassin, in 644, the Arab dominion had extended to the Nile and the Levant on the west, and to the farthest limits of Persia on the east. (See Omar. Ibn Al-Khatlab.) The next calif, Othman, reigned from 644 to 656; and he was succeeded in turn by Ali (656–661), who made the new city of Kufa, on the Euphrates, his capital.

The accession of Moâwiya I. to the califate in 661 marked the beginning of the hereditary period, and led directly to the great schism in the Mohammedan world which persists to the present day—*viz.*, the Sunnites, who recognize and obey the line of the califs as history determined them, and the Shiites, or those (*e.g.*, the Persians) who consider that the califate belonged legitimately to the family of Ali. Hitherto the califs, although autocrats, had been the nominees of an oligarchy. In the person of Moâwiya, however, began the dynasty of the Ommayads, or Ommiades, who reigned as follows: Moâwiya I. (661–680), Yazîd I. (680–683), Moâwiya II. (683), Merwan I. (683–685), Abdul-Melik (685–705), Walîd I. (705–715), Soliman (715–717), Omar II. (717–720), Yazîd II. (720–724), Hisham (724–743), Walîd II. (743–744), Yazîd III. (744), Ibrahim (744), Merwan II. (744–750).

During this period the Moslem empire was extended northeastward across the Oxus, Afghanistan and Baluchistan being also included within its borders. Not only did the whole of the north African coast provinces, from the Nile to the Atlantic, fall under the sway of the califate, but a further advance northward into Europe was made. In the reign of Walid I. Spain fell wholly under Arab dominion. Pushing still further north, the Arabs overran Southern and Central France and threatened to become the dominant power in Western Europe, when the splendid victory won by Charles Martel near Tours, in 732, turned the tide of Islamism, and forced the Moslems to retreat across the Pyrenees. The Ommayads, establishing themselves at Cordova in 755, in the person of Abdur-Rahman I., prolonged their rule in Spain until the year 1009, quite independent of the califate of the East. Thereafter the kings of Taifas, the Almoravides, the Almohades, and, lastly, the kings of Granada, successively upheld Islamism in Spain, though yielding ground with every century, until at length the conquest of Granada by the Spaniards, in 1492, drove the Moslems finally across the Strait of Gibraltar into Morocco.

Meanwhile Islam had been distracted by a long and violent struggle between the Ommayads and the rival house of the Abbasides, who were descended from Abbas, Mohammed's uncle. Under the leadership of Abu-'l-Abbas, this family vehemently asserted its superior claim to the califate; and the question was finally fought out (750) in a decisive battle from which the Abbasides emerged victorious. This was followed by a massacre of the whole clan of the Ommayads, with the exception of Abdur-Rahman, who escaped westward and founded the independent califate of Cordova.

The califate, carried through the line of the Abbasides, included the following rulers: Abu-'l-Abbas (750 – 754), Al-Mansur (754–775), Al-Mahdi (775–785), Al-Hadi (785–786), Haroun al-Raschid (786–809), Al-Emin (809–813), Al-Mamun (813–833), Motasim (833–841), Vathek (841–847), Motawakkil (847–861), Montasir (861–862), Al-Mostain (862–866), Al-Motadi (866–870), Al-Motamid (870–893), Al-Motadid (893–902), Al-Moktafi (903–908), Al-Moktadir (908–932), Kahir (932–934), Radi (934–940). With Radi the true califate ended; for though he was succeeded by other nominal 'successors' of the prophet, such power as they had once exercised passed to other dynasties, and even in the regions where their authority was still recognized the real power was in the hands of influential subjects. At length their empire was extinguished by the Mongol conquest of Bagdad in 1258.

The title, however, continued to be used by the descendants of the Abbassides until 1517, when it was assumed by the Sultan Selim I. upon his conquest of Egypt. After that time it was borne by the Turkish Sultans, though their right to the office was not acknowledged in Morocco, Tunis, Algiers, or India, nor by the Shiah sect. After the sultanate was abolished, the heir apparent, Abdul Medjid, was proclaimed calif, but in March 1924 the Turkish National Assembly voted the abolition of the califate and deposed and exiled Abdul Medjid as spiritual head of the Moslem world.

Consult Redhouse's *Vindication of the Ottoman Sultan's Title of Caliph;* Heidborn's *Droit public et administratif de l'Empire Ottoman;* Pears' *Turkey and Its People.*

Califor'nia (popularly called the 'Golden State'), a Pacific State of the United States, situated between the parallels of 32° 40′ and 42° N. It ranks second among the States in area, with a total surface of 158,297 square miles, including a water area of 2,645 square miles.

Topography.—The State has two extensive mountain systems—the Sierra Nevada in the eastern part, and the Coast Range in the western part—which combine in the northern section, forming a rugged and picturesque country. The Sierra Nevada averages about 50 miles in width, and in Mount Whitney (14,501 feet) has the loftiest peak in the United States, exclusive of Alaska. There are several other peaks in this range with altitudes of more than 12,000 feet: Mount Lyell (13,090 feet), Mount Shasta (14,380 feet), Mount Corcoran (14,093 feet), and Kaweah Peak (13,752 feet). All of these are in the southern part of the range except Mount Shasta, which is in the extreme northern part, and which is often classified as belonging to the Cascade Range, a northern continuation of the Sierra Nevada. The Sierras, while abrupt on their eastern face, fall in long, gradual slopes toward the west into the central valley. Noteworthy features are the many deep gorges, prominent among them being the Yosemite Valley (q. v.).

The Coast Range begins with the San Jacinto Range in the south, and includes the Santa Ana, San Bernardino, San Gabriel, Sierra Madre, San Rafael, Coast (a local name), and Monte Diablo ranges. The highest peaks of the Coast Range are in Southern California, and include San Bernardino (10,630 feet), San Jacinto (10,805 feet), and Tehachapi (9,214 feet). To the east of the San Bernardino Range is a depressed and arid region comprising Death Valley and the Mohave and Colorado Deserts.

The Great Valley between the Sierra Nevada and the Coast Range is about 450 miles long and 40 miles wide, and is remarkable for its fertility. Its northern basin is drained by the Sacramento River flowing southward, and its southern basin by the San Joaquin River flowing northward. These two rivers almost meet in the 1,600 square miles of alluvial delta opposite the gap in the Coast Range at San Francisco, and empty into San Pablo Bay, through Suisun Bay. The northern part of the Coast section is drained by the Klamath and Eel Rivers, noted for their salmon.

Climate.—The vast extent of the State, together with the wide variation of its physical features, has given California a greatly diversified climate. In the mountainous regions of the north the winters are severe, and in the northern sections west of the Coast Range fogs often prevail. In the southern part of the State the winters are extremely mild, except upon the mountain ranges; this section contains many popular winter resorts, such as Santa Barbara, San Diego, Los Angeles, and Monterey. The average mean temperature of San Francisco is 51° F.; of the valleys in the central part of the State, 64° F. San Diego, in the extreme south, has a mean winter temperature of 54° F. and a mean summer temperature of 68° F. Along the coast there is in summer a brisk ocean breeze blowing inland, tempering the seasonal heat. At night the movement is reversed, the cool air from the mountains flowing seaward. The climate of the State, taken as a whole, is dry and invigorating, and corresponds closely to that of the Mediterranean region of Europe.

The rainfall varies greatly, being about 60 inches at Eureka, on the northern coast, and less than 10 inches at San Diego. In general, there is a gradual decrease in rainfall from north to south.

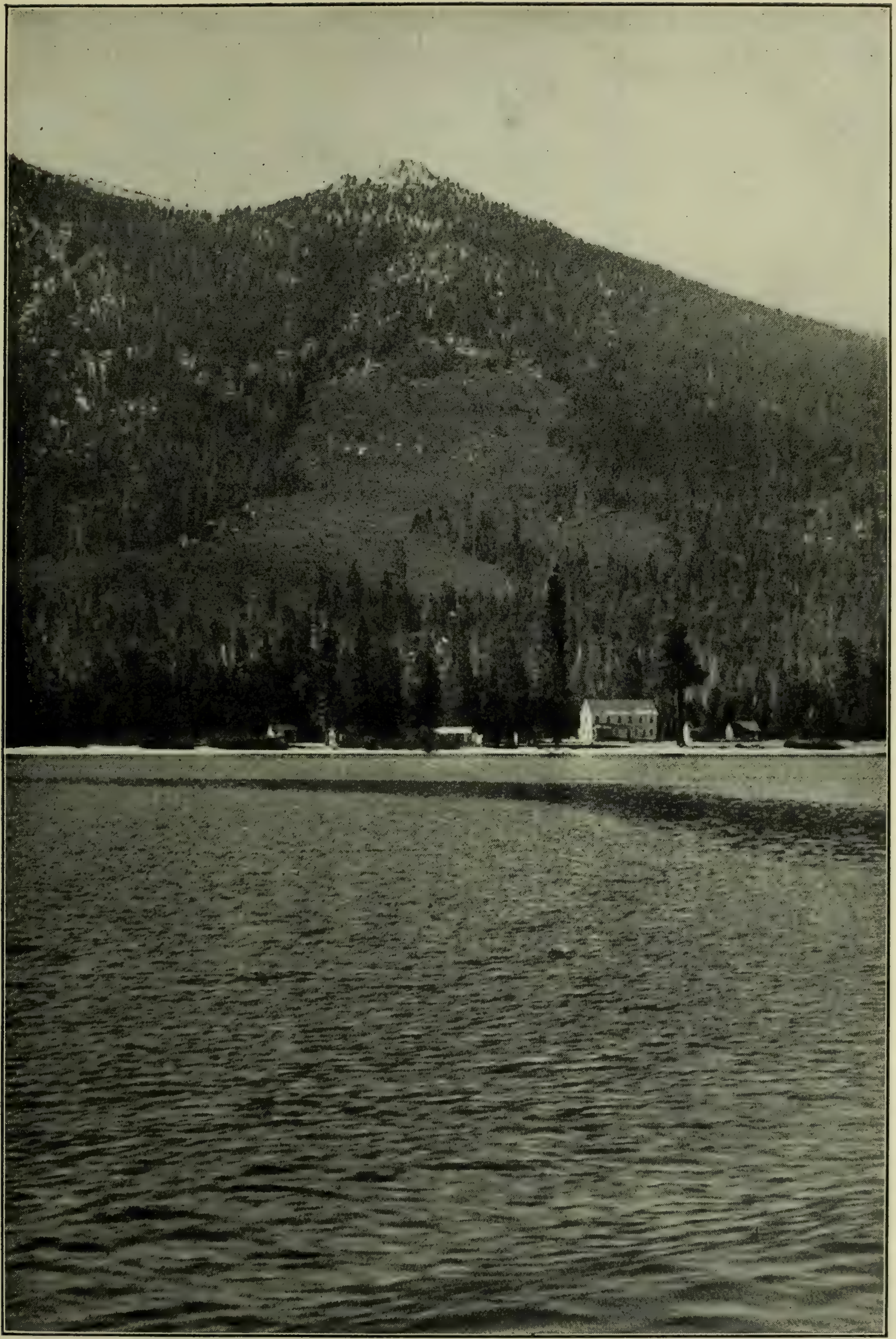
Geology.—The main axes of the Coast Range and of the Sierra Nevada probably belong to the Archæan. They are flanked by Jurassic and Triassic formations. In the northern part of the State occur lava beds, dating back to the Miocene, and volcanic cones are found in various sections.

Mining.—California ranks fifth among the States in the value of mineral products, with a net value, in 1919 (according to the U. S. Census Report), of $162,894,492, an increase of 168.7 per cent. over 1909; 22,201 persons (19,344 wage earners) were engaged in mining industries.

California ranks first among the States in placer mining, first in quicksilver production, third in the value of petroleum and natural gas, third in the mining and milling of gold- and silver-bearing ores, and seventh in copper output. Petroleum and natural gas production is the leading industry of the State, with a value in 1919 of $139,018,663, or 84.9 per cent. of the total value of mineral products. Production was reported principally from Fresno, Kern, Los Angeles, Orange, Santa Barbara, and Ventura counties.

The value of other important mineral products in 1919 was: gold and silver from lode mines, $8,773,757; gold from placer mines, $7,937,654; copper, $2,397,610; quicksilver, $1,217,077; magnesite, $677,661; basalt, $635,588; granite, $563,485; limestone, $540,987; lead and zinc, $261,454; clay, $177,246; sandstone, $65,074; abrasive materials, $61,313; chromite, $58,366. Asbestos, asphalt, barytes, feldspar, graphite, iron ore, manganese, marble, mineral pigments, pyrite, lignite, tungsten, silica, talc, soapstone, and precious stones are also found.

State estimates of the mineral production for 1921 include the following items: gold, $15,800,-



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CALIFORNIA

Lake Tahoe, a well-known summer resort of the Sierra region, is one of the largest lakes in the world at its altitude (6,300 feet). This beautiful lake, walled in by snow-clad mountain peaks, was discovered in 1844 by the American explorer, John C. Frémont.

000; silver, 3,500,000 fine ounces, $3,500,000; copper, 11,700,000 pounds, $1,477,710; lead, 800,000 pounds, $36,880; zinc, 850,000 pounds, $43,520; quicksilver, 2,400 flasks, $113,800; platinum, 500 fine ounces, $45,000; petroleum, 114,000,000 barrels, $182,400,000; natural gas, $3,900,000; magnesite, 54,000 tons, $540,000; brick, cement, building stone, crushed rock, etc., $27,000,000.

Forestry.—There are seventeen National Forests in the State, with a total area of 20,339,337 acres. The largest forests are: the Sequoia (2,626,590 acres); Santa Barbara (2,014,960 acres); Trinity (1,746,000 acres); Sierra (1,743,000 acres); Klamath (1,688,720 acres); Shasta (1,586,880 acres); Modoc (1,578,200 acres); and Cleveland (1,571,800 acres).

The principal trees are the redwood, western yellow pine, sugar pine, Douglas fir, white and red fir, and incense cedar. The pine regions, excluding National Park lands, comprise about 14,000,000 acres, and contain approximately 203 billion feet of timber. The redwood (*Sequoia sempervirens*), occurs only in California and, with the *Sequoia gigantea*, the largest tree in America, constitutes a characteristic feature of the flora of the State (see SEQUOIA). The redwood region, covering about 1,400,000 acres, has a stand estimated at 85 billion board feet. The average annual cut of timber in California is 1⅓ billion feet.

Fisheries.—The total yield of the fisheries of California in 1920 amounted to 212,635,075 pounds. The principal products were as follows: pilchards, 118,517,729 pounds; albacore and tuna, 36,114,340 pounds; salmon, 11,077,014 pounds; bonito or skipjack, 8,614,581 pounds; flounders, 7,792,626 pounds; rockfishes, 5,503,187 pounds; barracuda, 4,584,476 pounds. Other products are shad, sharks, skates, rays, shrimps, squid, spiny lobster, oysters, and cockles. In 1918, 34,436 cases of salmon were canned.

Agriculture.—California has an immense area of fertile soil; and though for a time mining offered greater attractions than agriculture, the latter industry has rapidly developed until it has become pre-eminent. The great central valley, formerly a pasture for sheep, then a vast grain field, s now the site of farms, orchards, and vineyards. In variety of agricultural products the State is unsurpassed, situated as it is in both the temperate and subtropical zones.

In the census year 1920 there were 117,670 farms in California, with a total acreage of 29,365,667, of which 11,878,339 acres were improved. The total value of all farm property was $3,431,021,861.

The introduction of irrigation has given an impetus, not only to fruit growing, but to dairy and general farming also. In 1920 irrigation was practised on 57.3 per cent. of the farms in the State, the number of acres actually irrigated being 4,219,040. The final cost of existing enterprises was estimated at $225,799,123, an increase of $141,406,779 over 1910.

According to the Federal census the acreage, production, and value of the principal crops in 1919 were: hay and forage, 2,202,583 acres, 4,494,940 tons, $96,121,846; wheat, 1,086,428 acres, 16,866,882 bushels, $36,938,477; barley, 987,068 acres, 21,897,283 bushels, $35,035,654; dry beans, 471,674 acres, 6,552,951 bushels, $30,798,869; rice, 130,367 acres, 6,926,313 bushels, $20,432,627; white potatoes, 63,305 acres, 8,217,937 bushels, $18,901,258; cotton, 87,308 acres, 46,418 bales, $9,237,182; sugar beets, 88,257 acres, 666,866 tons, $8,669,258; kafir and milo, 167,814 acres, 4,051,086 bushels, $6,886,848; hops, 8,118 acres, 12,610,055 pounds, $6,557,229; corn, 116,740 acres, 3,448,459 bushels, $5,862,383; oats, 146,889 acres, 2,966,776 bushels, $2,966,776; sweet potatoes, 7,632 acres, 867,300 bushels, $1,994,790.

The principal horticultural products are oranges, grapes, peaches, prunes, and lemons. Walnuts, apples, apricots, pears, almonds, cherries, figs, and olives are also largely grown. The orchard product in 1919 was valued at $267,817,846, while the estimated value to the grower in 1921 was $181,488,000. Shipments of fresh fruit in 1919 comprised 19,018 cars of grapes and 10,743 cars of deciduous fruits, exclusive of apples. The output of dried fruit in 1921 reached 397,000 tons, of which 135,000 tons were prunes, 182,500 tons raisins, 34,000 tons peaches, and the remainder, apples, apricots, figs, and pears. Olive culture is one of the oldest fruit industries of California, but no reliable figures for its production are available.

Stock Raising.—During its early history California ranked among the leading States in the number of sheep raised and in the amount of wool produced. In 1920 they numbered 2,400,151, valued at $25,906,445—an increase of 210.6 per cent. over 1910. The 1919 wool clip was 15,216,957 pounds; and the wool and mohair clip was valued at $6,805,621. Cattle numbered 2,008,037, valued at $120,681,446—an increase of 128.6 per cent. over 1910. Horses numbered 402,407, valued at $35,416,507; mules, 63,419, valued at $7,221,930; the ratio of decrease being 24.8 per cent. and 19.8 per cent., respectively, in the decade. Swine numbered 909,272, valued at $13,850,907, an increase of 171.2 per cent. The dairy industry is growing, the product in 1919 reaching a value of $55,642,649, half of which represents the butter output of 44,758,171 pounds.

The poultry industry flourishes under the favorable climatic conditions, and is carried on scientifically in several sections. The output of eggs for 1919 was 57,659,313 dozen, valued at $28,337,111.

The honey product (1919) was 5,501,738 pounds, valued at $1,100,351.

Manufactures.—Although agriculture and mining are the principal industries of California, the State shows a marked growth in manufactures during the last fifty years. The gross value of products per capita of the total population increased from $119 in 1869 to $578 in 1919. California ranked sixteenth among the States in 1869 in gross value of manufactured products, but had advanced to eleventh place in 1909 and to eighth in 1919.

In 1919 the State had 11,943 manufacturing establishments, which gave employment to an average of 296,999 persons during the year, and paid out $380,135,000 in salaries and wages. These establishments turned out products to the value of $1,981,443,000, to produce which materials costing $1,218,890,000 were utilized. The value added by manufacture was thus $762,553,000. The totals do not include the statistics for the U. S. Navy Yard at Mare Island.

According to State figures, the leading industries, with the value of their products, in 1920 were as follows: petroleum products, $194,000,000; dairy products, $100,000,000; lumber and timber products, $60,000,000; canning and preserving, $52,000,000; slaughtering and meat packing, $45,000,000; foundry and machine-shop products, $30,000,000; railroad car and shop construction, $25,000,000; bread and bakery products, $24,000,000; flour-and grist-mill products, $22,500,000.

The chief industrial centres are San Francisco, Los Angeles, and Oakland.

Railways.—In 1920 there were 16,068 miles of steam railway in California, a greater mileage than that of any other Pacific State. The first transcontinental railway to enter California was the Central Pacific, first operated in 1868. Other important lines are the Southern Pacific, the Atchison, Topeka, and Santa Fe, the Western Pacific, and the Union Pacific. There are also 28 electric railways, operating 1,888 miles of road.

Commerce.—The value of the merchandise trade carried on by the three customs districts of Los Angeles, San Diego, and San Francisco in the calendar year 1920 was $487,349,223, comprising imports, $235,396,253, and exports, $251,952,970. Of this, $238,027,065 represented imports to San Francisco, and $240,517,739 exports therefrom.

California, owing to its geographical position, controls a great part of the trade between the United States and Asiatic countries; and the increasing prosperity of Alaska, with which the State is connected by steamship lines, has materially advanced its commercial importance.

Finance.—The receipts of the treasury for the year ending June 30, 1920, were $71,857,133, and the disbursements $72,805,374. At the close of the fiscal year there was a balance on hand of $14,140,478. The chief items of revenue were the general property tax, railroad taxes, San Francisco harbor collections, and the collateral inheritance tax. The total bonded debt, on June 30, 1920, was $50,255,500, nearly all of which was held by the State school and university funds; outstanding warrants amounted to $4,654,592. The assessed valuation of all taxable property in 1921 was $4,929,479,508.

Banks.—On June 30, 1920, the national banks in California numbered 305, with a combined capital of $66,005,000; a surplus of $35,330,000; a circulation of $39,819,000; deposits of $660,926,000; loans of $624,677,000; and total assets of $1,092,956,000. The State, savings and private banks, and loan and trust companies numbered 420, with a combined capital of $84,188,000; a surplus fund of $38,683,000; deposits of $1,204,028,000; loans, $815,211,000; and aggregate resources and liabilities of $1,402,360,000.

Population.—In the census year 1920 California had a population of 3,426,861, an increase of 44.1 per cent. over 1910. The 1920 total included 38,763 negroes and 123,387 of other races. The native white population formed 75.4 per cent. of the total. Of the total population, 68.04 per cent. was urban and 34.98 per cent. rural. The population of California by decades has been as follows: 1850, 92,600; 1860, 379,900; 1870, 560,200; 1880, 864,700; 1890, 1,208,100; 1900, 1,485,000; 1910, 2,377,549.

The largest cities of the State in 1920 were: Los Angeles, 576,673; San Francisco, 506,676; Oakland, 216,261; San Diego, 74,683; Sacramento, 65,908; Berkeley, 56,036; Long Beach, 55,593; Pasadena, 45,354; Fresno, 45,086; Stockton, 40,296; San José, 39,642; Alameda, 28,806.

Education.—The executive power of the public school system is dual, being vested in a Superintendent of Public Instruction, elected every four years, and a State Board of Education, consisting of seven members, appointed by the governor. The Superintendent of Public Instruction is, *ex officio*, secretary of the State Board of Education and Director of Education. In the latter capacity he has charge of the Teachers' Colleges, the School for the Blind, the School for the Deaf, and the State Polytechnic School. County executive power rests in a county superintendent, while incorporated cities have city superintendents. The district is the unit of school government with a district board of school trustees. Financial support for the public schools is derived from State, county, and district taxes.

In 1921 the total enrollment in kindergartens, elementary, and secondary schools was 776,031, and the average daily attendance therein, 541,475. The teachers numbered 23,749. The total expenditure for school purposes was $73,221,951, and the value of all school property, $133,201,087.

Of the institutions for higher learning, the most important are: the University of California (q. v.), at Berkeley, with a southern branch located at Los Angeles; Leland Stanford Junior University (q. v.), at Palo Alto; the University of the Pacific (M. E.), near San José; Pomona College (Cong.), at Claremont; Throop Polytechnic Institute (q. v.), at Pasadena; Occidental College, at Los Angeles; the University of Southern California (q. v.), at Los Angeles; and Mills College (for women), at Oakland. Lick Observatory (q. v.), on Mount Hamilton (near San José), is a part of the University of California. There are seven State teachers' colleges, located at San José, Chico, San Diego, Santa Barbara, Fresno, San Francisco, and Arcata. In the technical class there are two State institutions—the University Farm School at Davis and the State Polytechnic School at San Luis Obispo.

Charities and Corrections.—The State penal and charitable institutions are in charge of a State Board of Charities and Corrections, consisting of six members, appointed by the governor for a term of four years. These institutions include State prisons at San Quentin and Represa; the Preston School of Industry, at Waterman; the Whittier State School, at Whittier; hospitals for the insane at Agnew, Stockton, Napa, Talmage, Norwalk, and Patton; the Sonoma State Home, at Eldridge, and Pacific Colony, at Spadra—homes for the feeble-minded; the Industrial Home for Adult Blind, at Oakland; California School for Girls, at Ventura; and the State Industrial Farm for Women, at Sonoma. The State Board of Charities and Corrections also has under its supervision numerous children's institutions, some under sectarian, others under non-sectarian, control.

Government.—The constitution now in force was adopted in 1879. Amendments require a two-thirds vote of each branch of the legislature and the approval of the electorate. Constitutional amendments establishing the initiative, referendum, and the recall of all elective officers, including judges, were ratified Oct. 10, 1911. Women were enfranchised on the same date.

The executive power is vested in a Governor, Lieutenant-Governor, Secretary of State, Controller, Treasurer, Attorney-General, and Surveyor-General, all of whom are elected for four years, and in six administrative departments under the governor. The legislature consists of a Senate, composed of 40 members, elected for four years, and an Assembly of 80 members, elected for two years. Sessions are held biennially, and no pay is allowed members for a longer time than sixty days. No bill can be introduced after fifty days from the commencement of the session without the consent of two-thirds of the members.

The judicial power is vested in the Senate, sitting as a court of impeachment; in a Supreme Court, consisting of a Chief Justice and six Associate Justices, elected for a term of twelve years; District Courts of Appeal, Superior Courts, and Justices of the Peace.

The State has a direct primary law, first exercised in August, 1910; an employers' liability law; and a child labor law which prohibits the employment of children under fourteen, and of those under sixteen between 10 P.M. and 6 A.M.

Under the Congressional apportionment founded on the Thirteenth U. S. Census, California has 11 Representatives in

Congress. Sacramento is the State capital.

Recent Legislation. — Important legislation enacted during the past decade includes an act providing for a State railroad commission, an amendment to the primary election law, establishing presidential primaries and the initiative and referendum in countries, cities, and towns, and an act providing for protection of horticulture (1912); alien land laws for the purpose of eliminating Japanese as owners of land, a mother's pension law, a minimum wage law for women and minors, and laws extending the scope of the workman's compensation act, and establishing an eight-hour law for underground workers (1913); measures relating to the administration of justice, provision for absent voting by those in the national service, and amendments to the insurance laws (1917); a compulsory part-time education law, a law providing an industrial farm for the rehabilitation of fallen women, amendments to the child labor laws, a law creating a Department of Agriculture, and ratification of the Federal prohibition amendment (1919); an anti-alien land leasing law (1920); a bill centralizing the government into six administrative departments, and a State prohibition enforcement act (1921).

History. —The name California was first used in a book by Garcia Ordoñez de Montalvo (*Las Sergas de Esplandian*), published in Spain in 1510. It was applied by Cortes to his colony at La Paz (Lower California) in 1537.

The first European who is known to have visited what is now California was Juan Rodriguez Cabrillo, who voyaged along the coast as far north as Pt. Conception, discovered San Diego Bay, and visited many of the islands along the coast. Other early explorers include Francis Drake (1579), Francisco de Galli (1584), Thomas Cavendish (1587), Sebastian Rodriguez de Cermenon (1595), and Sebastian Vizcaino (1602). San Diego was occupied by Spanish missionaries in 1769; and later, other missions were established farther north at Monterey in 1770 and San Francisco in 1776. The first of the pueblos was founded in 1777 at San José, and four years later another was established at Los Angeles. The missions increased rapidly in number, and at the close of the eighteenth century had been founded a day's journey apart.

The entire situation was changed when, in 1822, Mexico became independent of Spain. California passed under Mexican control, and in November of that year a provincial legislature chose Don Luis Argüello as the first Mexican governor. California was allowed considerable freedom in matters pertaining to local government, but its growth was checked for some time by the restrictions placed upon foreign trade.

At first the relations between California and Mexico were pleasant; but about 1830 a spirit of unrest and dissatisfaction began to pervade the province. This feeling was augmented in 1835, when the able governor, Figueroa, died; and the following year a movement headed by Alvarado succeeded in obtaining control of the province, with the exception of the region about Los Angeles and San Diego, which was not brought under subjection until 1837. Alvarado's idea was to make California a sovereign state, and at the same time maintain a federal union with Mexico. In 1838 the Mexican government recognized him as constitutional governor of the department of California; and his position was assured in 1845, when, after a final attempt to install a Mexican governor, the forces of Alvarado, in a bloodless engagement, compelled the Mexican army to capitulate.

About this time a considerable American immigration started, and American settlements sprang up throughout the province, notably in the Sacramento Valley. In June, 1846, an American surveying party under the leadership of John C. Frémont (q. v.) inaugurated the 'Bear Flag Revolt,' captured the town of Sonoma, and on July 4 issued a proclamation declaring California independent. This movement was in opposition to the policy of the United States toward California, and was officially discredited; but on July 7, acting under instructions from the U. S. Government, then engaged in war with Mexico, Commodore Sloat took possession of Monterey and San Francisco (known as Yerba Buena). Frémont then put his company under the orders of Sloat. Further operations on the part of the United States soon brought about the complete occupation of California, and on Aug. 15, 1846, it came into the Union as a free and sovereign State, with its own constitution, governor, and legislature.

Two years later, on Jan. 24, 1848, gold was discovered at Sutter's Mill, Coloma, and immigrants to the number of many thousands flocked to California from all parts of the world. A very large proportion of these immigrants were lawless and irresponsible, and the conditions in the State, until the better element by drastic measures succeeded in establishing law and order, were such that life and property were in continual jeopardy. (See FORTY-NINERS.)

A State constitution prohibiting slavery was approved by the electorate in 1849, and the following year California was admitted to Statehood under the provisions of the Omnibus Bill (q. v.).

During the period of 1870–90 local politics were strongly influenced by the question of restricting Chinese immigration; and the Workingman's Party, headed by Denis Kearney (q. v.), elected its candidates in many of the cities, and was largely responsible for the enactment of the present radical constitution.

In 1906 the exclusion of Japanese students from the public schools of San Francisco raised a State-wide discussion and resulted in international negotiations between the United States and Japan. Again in 1913 the passing of anti-alien land laws, designed to prevent Japanese settlers from owning land in the State, caused much discussion, and Secretary of State Bryan visited California in an attempt to aid in framing a law which would be acceptable to the people and yet not disturb international relations with Japan. The result was the Webb bill, which went into effect in August, and a series of negotiations between Japan and the United States which were not made public.

California lies in an earthquake belt. The earliest recorded severe shock occurred in 1812, destroying mission buildings in Los Angeles and Santa Barbara counties and killing about forty persons. In 1851 San Francisco was considerably damaged; and there were other shocks in 1855, 1856, 1865, and 1918. On April 18, 1906, the State was visited by the worst earthquake in its history, extending over about 190 miles and centring in San Francisco (see SAN FRANCISCO EARTHQUAKE).

On the morning of Oct. 1, 1910, the Los Angeles *Times* building was destroyed by an explosion, and twenty-one of the workers in the building were killed. Suspicion was fastened on John J. McNamara, secretary of the International Association of Bridge Workers, James B. McNamara, his brother, and Artie McManigal, and the three eventually confessed to the crime.

In 1914 and in 1916 serious floods in the southern part of the State caused serious property loss.

In national politics California is usually Republican. The Democrats were in control up to 1860, however, and also carried the State in 1880, 1892, and 1916, *Bibliography.*—Consult Bancroft's *History of the Pacific States of North America;* Hittell's *History of California* (4 vols.); Royce's *California* (in 'American Commonwealth Series'); James' *In and Out of the Old Missions of California;* Peixotto's *Romantic California* (1910); Muir's *Mountains of California* (9th ed., 1911); Richman's *California under Spain and Mexico* (1911).

California, city, Missouri, county seat of Moniteau County, on the Missouri Pacific Railroad; 25 miles west of Jefferson City. It has manufactures of woollen goods, men's work garments, harness, crockery, vehicles, ice, cream products, and carbonated water. Pop. (1910) 2,154; (1920) 2,218.

California, borough, Pennsylvania, in Washington County, on the Monongahela River, and on the Pennsylvania Railroad; 27 miles southeast of Pittsburgh. It is the seat of the State Normal School. Coal is mined in the vicinity. There is steamboat connection with Pittsburgh. Pop. (1910) 2,230; (1920) 2,480.

California, Gulf of (called also PURPLE SEA—*Mar Bermejo* —and SEA OF CORTES), an arm of the Pacific, 700 miles long and 60 to 150 miles broad, which separates the peninsula of Lower California from Mexico. It contains numerous islands. The chief ports—La Paz, Loreto, Santa Rosalia, and others—have good harbors. The Colorado River debouches at its head, its extensive deposits causing shallows in the northern part. The depth at the southern end is about 6,000 feet. Pearls, coral, and sponges are the principal commercial products.

California, Lower, territory of Mexico, occupying the peninsula of that name, which runs southeast from California, United States. Its width, which varies greatly, averages 75 miles, its length is about 800 miles, and its area is 58,328 square miles. Cape San Lucas (lat. 22° 52′ N.) is the southern extremity. Four-fifths of the area is covered with mountains, largely of granite formation, running north and south, and rising from 3,250 feet to 10,075 feet in the San Pedro Martir Range. Gold, silver, copper, iron, sulphur, manganese, gypsum, coal, onyx, and salt are found, and there are indications of the presence of petroleum and of precious stones. Fossil remains are abundant in some localities. The Colorado forms the northeastern boundary for 125 miles; the other rivers of importance are the Hardy and the Purisima. There are occasional springs. The rainfall is scanty; the climate dry and healthy. The flora consists chiefly of cactuses, yuccas, mimosas, and other forms characteristic of dry regions.

The level parts of the territory are largely desert. There is little irrigation, except in the rapidly developing section opposite the Imperial Valley in Southern California. Grain, legumes, henequen, sugar cane, hemp, tobacco, and tropical fruits are raised in the limited area under cultivation. Pearl and shark fisheries are important—about $300,000 worth of pearls being shipped annually to the United Kingdom. The roads follow the old Jesuit foot trails. A concession was granted in 1911 for a railroad along the northern boundary, the only lines in the territory (2 and 6 miles respectively) at that time being operated in connection with mining properties.

Foreign trade is carried on through the ports of La Paz, Magdalena Bay, Santa Rosalia, and Ensenado. The capital is La Paz. Pop. (1920) 62,831, largely half-breeds.

Lower California was discovered by Cortez in 1533, and settled by the Jesuits in 1642.

California Poppy. See ESCHSCHOLTZIA.

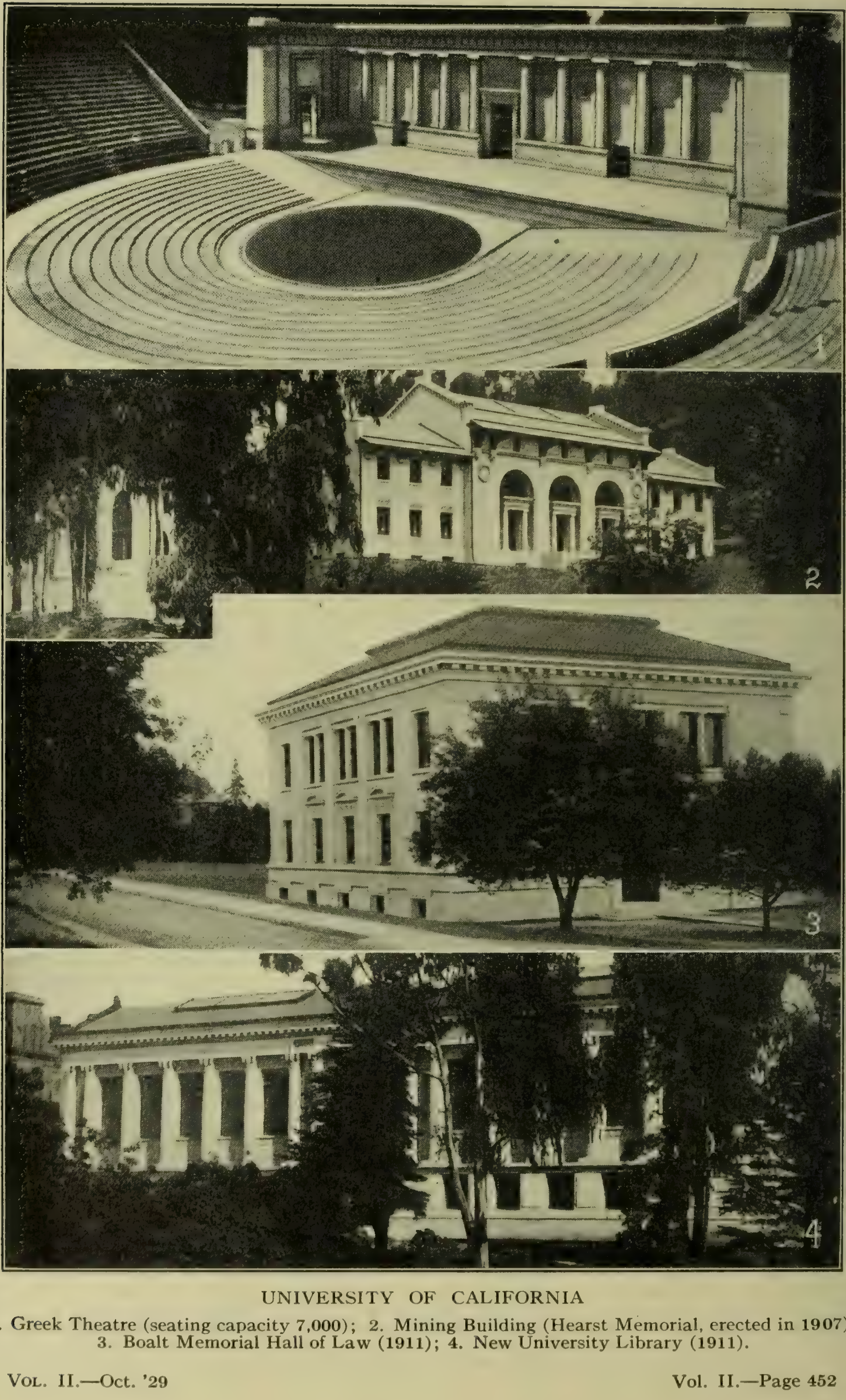
California, University of, a coeducational institution of higher learning in Berkeley, Cal. It was organized in 1868, and opened at Oakland in 1869, when the College of California, incorporated in 1855, closed its work and transferred its property to the State for the use of the new University. The University was transferred to its present site in 1873.

The University occupies a commanding site of about 530 acres overlooking the Bay of San Francisco. The campus is being developed on an architectural plan adopted after an international competition in 1898, made possible by the generosity of Mrs. Phœbe A. Hearst. The following buildings have been erected in accordance with this plan: The Greek Theatre (1903, the gift of W. R. Hearst); California Hall (1904, by State appropriation); the Hearst Memorial Mining Building (1907, gift of Mrs. Phœbe A. Hearst); the University Library (1911, by bequest of Charles Franklin Doe); Boalt Memorial Hall of Law (1911, by gift of Mrs. Elizabeth Boalt and the Bench and Bar of California); Agricultural Hall (1921, by State appropriation); Hilgard Hall, completed in 1917; Le Conte Hall for physics (1923); Hesse Hall, engineering (1923); Memorial Stadium (1923); and Haviland Hall (1924).

As at present organized, the University comprises the following departments: in Berkeley—Colleges of Letters, Social Sciences, Natural Sciences, Commerce, Agriculture, Mechanics, Mining, Civil Engineering, Chemistry, Medicine (first year); Schools of Architecture, Education, Jurisprudence and Librarianship, University Extension Division and Institute of Child Welfare; at Mount Hamilton—Lick Observatory; in San Francisco—California School of Fine Arts, George Williams Hooper Foundation for Medical Research, Hastings College of Law, College of Medicine (second, third, fourth and fifth years), College of Dentistry, and California College of Pharmacy; in Los Angeles—College of Medicine (Los Angeles Department, graduate instruction only) and University of California at Los Angeles, including College of Letters and Science and Teachers College; in Riverside—Citrus Experiment Station and Graduate School of Tropical Agriculture; in Whittier—Southern California Pathological Laboratory; in the Imperial Valley—outlying agricultural station; in La Jolla—Scripps Institution for Biological Research; in Pacific Grove—Herzstein Seaside laboratory; in Santa Monica and Chico—forestry stations; and in Davis—University Farm School. Annual summer sessions of six weeks are conducted, the attendance being several thousand. A department of University Extension was organized in 1902, the agricultural section of which conducts farmers' institutes and operates a demonstration train through the State. The University, through its examiners, is closely in touch with the high schools of the State.

The government of the University is vested in a Board of Regents of twenty-three members, including the governor of the State and the president of the University. The internal management is in the hands of the faculties and the academic senate, with standing committees in charge of the academic, graduate, professional, and editorial work.

The endowment of the Academic College and Lick Observatory consists of the Seminary and Public Building funds; the property derived from the College of California, including the site at Berkeley; the fund derived from the Federal Land Grant of 1862; the State University fund; the Tide Land fund; State appropriations; individual gifts; two Experiment Station funds of $15,000 a year each; and the Morrill College aid fund of $50,000 a year. Tuition is charged to resi-



UNIVERSITY OF CALIFORNIA

1. Greek Theatre (seating capacity 7,000); 2. Mining Building (Hearst Memorial, erected in 1907); 3. Boalt Memorial Hall of Law (1911); 4. New University Library (1911).

dents of California only in the professional colleges (exclusive of law). For recent statistics see Table under the heading College.

Caligula, ka-lig'ū-l*a* (12–41 A.D.), Roman emperor, was the son of Germanicus and Agrippina. He was born in Antium, but was brought up in his father's camp in Germany. His real name was Gaius Cæsar—'Caligula' being a nickname given him by the soldiers from his wearing, as a child, small *caligæ*, or soldiers' boots. On his father's death he ingratiated himself with Tiberius and on the death of the latter in 37 A.D. (which he is believed to have hastened), he was declared heir to the throne. For the first few months he acted with justice and moderation; but after a severe illness he appeared as the most sanguinary tyrant known to history and unquestionably he was insane. He made his horse a consul; and leading his legions to the coast of Gaul, as if for an invasion of Britain, he bade them pick up the shells as trophies from the ocean, and led them away. He was barbarously cruel, delighting in torture and bloodshed; he also insisted on divine honors being paid to him. At last, in January, 41 A.D., Cassius Chærea, tribune of a prætorian cohort, formed a conspiracy, and murdered him. Fragments of valuable bronzes have been recovered from his famous floating gardens sunk in Lake Nemi. Dramas based on Caligula's life have been written by Crowne (1698), Dumas *père*, Möller (1906), Vittori (1910), and Glaser (1910).

Cal'ipers, a kind of compass with curved legs, used in machine shops for measurements, such as the determination of diameters of shafts, bores and centring. Vernier and micrometer calipers are used for minute measurements. See Vernier; Micrometer.

Caliph. See Calif.

Calippus, ka-lip'us, or Callipus (*c.* 330 B.C.), Greek astronomer, who invented the Calippic lunar cycle. See Calendar.

Calisaya. See Cinchona.

Calisthenics. See Gymnastics.

Calixtus, ka-liks'tus (Callixtus) **I.** (d. 222), bishop of Rome and saint, elected 219, and martyred Oct. 14, 222. He is known as the constructor of the celebrated catacombs on the Appian Way at Rome.

Calixtus II. (d. 1124), Pope of Rome, was elected 1119, previous to which he was archbishop of Vienne, in France. He was a relative of the Emperor Henry v. When he became Pope he made an arrangement—the Concordat of Worms, 1122—with Henry, by which the latter abandoned the papal privilege of spiritual investiture by ring and crosier, but retained that by sceptre, as representing the temporal power.

Calixtus III., the name of two Popes. The first was one of the anti-Popes elected in 1168, under the influence of Frederick Barbarossa, in opposition to Alexander III. The second was Alfonso de Borga, a Spaniard, elected in 1455. He annulled the sentence against Joan of Arc, and appealed to Christendom against the Turkish invasion in 1456. He died in 1458.

Calixtus (Callisen), Georgius (1586–1656), Protestant theologian, was born in Medelbye, Schleswig. He became professor of theology at Helmstedt, and attacked the Roman Catholic Church; but, later, the Lutherans believed that he was too tolerant of Roman Catholic tenets, and found him guilty of heresy. For his Calvinistic leanings, shown at the conference of Thorn in 1645, he was subjected to a further charge of apostasy. His dispute with the Lutherans, known as the Syncretistic controversy, lasted for many years. His chief work is *Epitome Theologiæ Moralis* (1634). He was styled by Bossuet 'the most able Lutheran of our time.'

Calking. See Caulking.

Call, in finance 'Call money' means money deposited with a bank, or loaned by a bank, and returnable when called for. A call with reference to stocks or shares has several meanings: (1) An instalment of capital to be paid by subscribers to a new company, or to a new issue of shares. (2) A demand for contribution made upon the shareholders by the liquidator of a company which is being wound up. (3) An option to buy certain stocks or shares at a certain price on a certain date (see Stock Exchange).

Calla, kal'*a*, a genus of plants of the family Araceæ. *C. palustris*, the only species of the genus, is a marsh plant with trailing stems and heart-shaped leaves. The inflorescence has a white, elliptical spathe, and is attractive and interesting. The water arum, as the calla is sometimes called, is easily grown in a pond or piece of boggy ground. The calla lily, with creamy white or yellow spathes, known as *Richardia*, also an arum, is frequently cultivated.

Callahan, James Morton (1864–), American educator, was born in Bedford, Ind. He was graduated from Indiana University in 1894, and received a doctorate from Johns Hopkins in 1897. He was acting professor at Hamilton for one year, and lecturer at Johns Hopkins for four years; he was also director of the Bureau of Historical Research (1900–2); and since 1902 has been professor and head of the department of history and political science and dean (since 1916) of the College of Arts and Sciences at West Virginia University. In 1911 he was a delegate to the National Conservation Congress. He is well known as a writer on diplomacy and international relations, and is the editor of the *West Virginia University Studies in American History*. His published works include *Neutrality of the American Lakes* (1898); *Cuba and International Relations* (1899); *American Relations in the Pacific and the Far East* (1901); *Confederate Diplomacy* (1901); *American Expansion Policy* (1908); *Alaska Purchase* (1908); *Evolution of Seward's Mexican Policy* (1909); *History of West Virginia* (1923); and many monographs and magazine and encyclopædia articles.

Callao, käl-yä'ō, chief port of Peru, in Callao province, at the mouth of the Rimac River; 7 miles southwest of Lima, with which it is connected by two railroads and an electric tramway. The average annual temperature is 68° F. The town has an old jail and fortress, now used as a custom house; a hospital, a modern naval school, and a wireless station. The water-supply system, installed in 1904, and the sewerage system, recently completed, have greatly improved sanitary conditions and public health. Industries include the manufacture of sugar, flour, cocaine, liquors, matches, cigarettes, and machinery.

Callao is the starting point of the famous Oroya Railroad (138 miles) and of the line to Cerro de Pasco (221 miles). It has a good harbor, protected by San Lorenzo Island, and equipped with docks and sea walls. The chief exports are copper, silver, hides, guano, salt, coffee, sugar, and wool. The annual trade amounts to more than $25,000,000. Callao province includes the city, the villages of Bella Vista and La Punta, and several islands. Pop. province (1920) 52,843.

Callao was founded in 1537, and became an important centre of trade with Spain. It was destroyed by an earthquake and tidal wave in 1746.

Callcott, kôl'kut, Sir Augustus Wall (1779–1844), English artist, called 'the English Claude,' was born in London. He first became a portrait painter, but finally devoted himself to landscapes. His best pictures, painted between 1812 and 1824, are bright, pleasant, and finished in execution. Later he was successful in large figure subjects. In 1837 he exhibited *Raffaele and the Fornarina*, and was knighted; and in 1844 he was appointed conservator of the Queen's pictures.

Calles, Plutarco Elias (1877–), Mexican public official, was born in Guaymas, in the State of Sonora. He taught school for a short time and held various municipal offices. In the revolutionary struggles he fought on the side of Madero and Obregon and became Secretary of Commerce and Labor in Carranza's Cabinet. Later he was made Secretary of State in Obregon's Cabinet. In 1924 he was elected president of Mexico. He is interested in educational and social reforms, and the agrarian rights of the peons.

Callias, kal'i-*a*s, a name borne by various members of a noble Athenian family famous for their wealth. The best known was an ambassador from Athens to Artaxerxes, king of Persia, who is said to have concluded (*c.* 448 B.C.) the so-called Peace of Callias, which assured the liberty of the Greek towns of Asia Minor, and closed the Ægean to the Persians. The existence of a formal treaty has been questioned; but it is regarded as probable that some understanding was reached, and that Callias was the ambassador through whom it was accomplished.

Callichthys, kal-ik'this, a genus of cat-fish or siluroids, including about a dozen species found in the rivers of tropical America. The body is enclosed in four rows of bony plates, and the head is also armored. Like their allies in the same region, these cat-fish are capable of migrating overland from one river to another, and construct nests of leaves for their ova. See Cat-Fish.

Callimachus, ka-lim'*a*-kus (*c.* 310–240 B.C.), scholar and poet, was born in Cyrene, and lived in Alexandria, where he was in charge of the famous library from about 260 to 240 B.C. Among his pupils were Eratosthenes, Aristophanes of Byzantium, and Apollonius Rhodius. He wrote about eight hundred works, of which only half a dozen hymns, some sixty epigrams, and some fragments of elegies are extant. They are characterized by extreme artificiality and great learning, being full of recondite allusions. They were highly esteemed, however, by the Romans, and had great influence on such poets as Catullus (who imitated his *Coma Berenicæ*), Propertius, Ovid, and Virgil. His greatest work, unfortunately lost, was a comprehensive history of Greek literature. In antiquity, *Ætia*, a volume of elegies, and *Hecale*, an epic which had Theseus for its hero, were especially celebrated.

Callinus, ka-lī'nus, the earliest extant writer of elegiac poetry in Greece; indeed, the invention of that metre is usually attributed either to him or to Archilochus. He was a native of Ephesus, and lived in the sixth or seventh century B.C. Only a few fragments of his poems survive, among them a war song (twenty-one lines) of great beauty.

Calliope, ka-li'ō-pē, mother of Orpheus, the first of the Nine Muses. She presided over epic poetry, and is generally represented with a wax tablet and a pencil.

Callirrhoe, kal-lir'rō-ē, a famous ancient fountain in Athens, one of the chief sources of the water supply of that city.

Callisthenes, ka-lis'thi-nēz, Greek historian and philosopher, was born in Olynthus. His mother was a cousin of Aristotle, whose pupil he was. He accompanied Alexander the Great on his Asiatic expedition; was implicated in the conspiracy of Hermolaus to assassinate the king; and was put to death in 328 B.C. His works—none extant—included an account of the expedition, a history of the Trojan War, and a history of Greece in ten books.

Callisto, ka-lis'to, an Arcadian nymph, companion of Artemis. She was loved by Jupiter, and Juno, in jealousy, changed her into a she-bear. One account says that Artemis meeting her while hunting, was about to slay her, when Jupiter snatched her away and placed them both in the heavens as the Great and Little Bear. Her son Arcas was the progenitor of the Arcadians. Callisto is merely a type of Artemis Calliste, 'the most beautiful.'

Callistratus, ka-lis'tr*a*-tus, a prominent Athenian public man and orator, between 380 and 360 B.C., whose policy was usually friendly to Sparta. In 366 he advised a temporary surrender of Oropus to Thebes. As the Thebans refused to restore the town, he was condemned to death for his evil counsel, but fled into exile. In 356 he returned, without having obtained pardon, and was executed. His oratory was greatly admired by Demosthenes.

Callorhynchus, kal-o-rin'kus, a fish genus nearly allied to Chimæra (q.v.). The single species (*C. Antarcticus*), popularly called 'bottle-nosed chimæra,' inhabits the seas of the South Temperate zone. It has the long tail bent upward at the extremity.

Callosities, ka-los'i-tēz, bare patches of skin in which the epidermis is hardened and thickened, are of frequent occurrence in mammals. They occur especially on surfaces subjected to pressure, and are thus found on the under surface of the feet of most mammals, over the ischial tuberosities of many monkeys, as well as in other locations. They are an especially conspicuous feature in the camel; and in the horse and its allies the callosities on the inner side of the limbs are of considerable systemic importance.

Callot, kȧ-lō', Jacques (1592–1635), French draughtsman and etcher, was born in Nancy, Lorraine. At the age of twelve he ran away from home, and joined a band of gypsies, whose features he has immortalized in a series of engravings, generally known as *Les bohêmiens*. These pictures exemplify his work, displaying his characteristic humor, verve, and extraordinary wealth of detail. Leaving the gypsies at Florence (where, and at Rome and elsewhere, he rapidly acquired great skill as an etcher), he became famous in Tuscany, Lorraine, the Spanish Netherlands, and France. Of the many engravings he left, the greater part depict, with intense reality and not without a touch of satire, the pomp and social life of his time. His *Misères de la guerre* (25 plates) and *The Nobles* (12 plates) may be specially mentioned.

Common Heather or Ling
(*Calluna vulgaris*)

1, Flower; 2, corolla and pistil; 3, stamens; 4, leaf.

Calluna, a genus of the order Ericaceæ, of which one species, *C. vulgaris*, is the ling or common heather.

Calmar. See KALMAR.

Calmet, AUGUSTINE (1672–1757), French theologian and historian, born near Commercy. Entering the Benedictine order, he was successively professor of theology in the abbey of Moyen-Moutîer (1696), prior of several monasteries, and in 1728 became abbot of Senones in Lorraine, where he remained to the end of his life. He supervised the publication in Paris of the famous *Commentaire Littéral sur tous les Livres de l'Ancient et du Nouveau Testament* (23 vols. 1707–16). Among his other works are *Dictionary of the Bible* (Fr. 1722; Eng. new ed. by Buckley, 1856), and *Histoire Ecclésiastique et Civile de Lorraine* (4 vols. 1728), his principal book. See *Life*, by Dom E. Fangé (1763).

Calmucks. See KALMUCKS.

Calochortus. A liliaceous genus of plants found chiefly in the Far West, and especially in California, in all sorts of situations and soils. They are called mariposa lilies, star-tulips, and the like, and are very beautiful, with a cup-shaped perianth of unequal segments, the 3 inner ones being the larger. They have a wide range of color, and may be either delicate or showy in tint. The stems are more or less leafy and branched, and spring from a coated corm. This little corm, especially that of the sego lily (*C. Nuttallii*), forms a tidbit and food for various aborigines, and is called by certain tribes 'sego.' It is prevalent in the valleys of Utah. Not many of the calochorti are hardy enough for general cultivation, but they are greenhouse plants. Among the best for amateurs are the varicolored *C. Nuttallii;* the lilac *C. lilacinus*, and *C. Venusta*, with its many hybrids of many hues. *C. luteus* and *C. clavatus* are yellow-flowered. These are the hardiest, but all calochorti suffer more from alternate thawing and freezing than they do from extreme cold.

Calomarde, DON FRANCESCO TADEO(1775-1842),Spanish statesman, born at Villel, Aragon, and after studying law attracted the notice of Ferdinand by his abilities. A zealous absolutist, Calomarde acted as minister of justice (1824–33), framing new penal codes, recalling the Jesuits, closing the universities, and persecuting the Liberals by tyrannical statutes. In favor of Don Carlos, he carried the abolition of the laws regulating the Spanish succession to the exclusion of Isabella; but in 1833, on the assumption of the regency by the queen-mother (Christina), Calomarde fled to France, where he resided until his death.

Calomel, mercurous chloride, or subchloride of mercury, is found native as 'horn quicksilver,' but is generally manufactured by triturating a mixture of mercuric sulphate, common salt, and metallic mercury, subliming, and washing with boiling water. It is a white, heavy, ordorless, and tasteless powder that is almost insoluble in water. It is blackened by ammonia, and sublimes when heated, forming a gas with a density that corresponds to the formula HgCl, which condenses on a cool surface unaltered. There is a strong opinion, however, that this vapor is a mixture of mercuric chloride and mercury formed by the decomposition $Hg_2Cl_2 = HgCl_2 + Hg$, and that calomel has thus really the formula Hg_2Cl_2. Calomel is used in medicine for very various purposes, and is administered by inunction, as a lotion, or internally in the form of pills. It has the antiseptic qualities characteristic of mercurial preparations. In small internal doses, from one-tenth of a grain to one grain, it is of the highest use in congestive conditions, especially those due to over-eating, over-indulgence in alcohol, want of exercise, etc., by its effect in producing more rapid changes in all tissues of the body. For this purpose it may be taken in small continued doses, in which form also it has been found to check vomiting in children. In doses of from four to eight grains for an adult it acts as a purgative, by stimulation of intestinal glands and irritation of the mucous membrane. In larger doses it is a gastric and intestinal irritant, producing severe vomiting and diarrhœa. Calomel is much used as a specific for syphilis, being administered internally or by inunction over prolonged periods; but if pushed too far excessive salivation sets in, a blue line may be seen along the gums, and in extreme cases the teeth may be loosened and fall out.

Calonne, CHARLES ALEXANDRE DE(1734–1802), French statesman, became advocate-general of the chief council of Artois, then *procureur-général* to the Parlement of Douay, intendant of Metz, and afterward of Lille, in which capacity he displayed so much ability that Louis XVI. appointed him (1783) minister of finance. To meet the increasing expenditure of the state, Calonne proposed (1787) to abolish the pecuniary immunities from taxation of the nobles, the magistrates, and the clergy—a measure which met with such violent opposition that he was forced to resign.

Calophyllum, a genus of beautiful evergreen, leathery-leaved tropical trees, order *Guttiferæ.* The flowers, which are borne in loose racemes, are usually white and fragrant. *C. Calaba* yields a green fruit, and *C. inophyllum* a red one. The seeds of the latter yield an oil (dilo) which is used in the Fiji and Hawaiian Islands as a remedy against rheumatism. The timber also is valuable for building purposes. Other species, too, give excellent timber, and some of the species yield the resin known as tacamahaca.

Caloric Engine, or HOT-AIR ENGINE. See AIR ENGINES.

Calorie is a unit of quantity of heat. It is usually stated as the amount of heat required to raise 1 gram of water 1° C.; but as this varies slightly with the initial temperature, it is necessary to specify that the rise is from some given point, such as from 15.5° to 16.5° C., or that it is $\frac{1}{100}$ of the quantity of heat required to raise 1 gram of water from 0° to 100° C. In dealing with larger quantities of heat, the large calorie, or heat required to raise 1 kilogram of water 1° C., is employed; and this is equal to 3.97 B.T.U. (British thermal units), or quantity of heat that will raise 1 lb. of water 1° F. Owing to the uncertainty in the definition of the degree of temperature, and the variation in the specific heat of water, it is better to express quantity of heat in terms of units of work, heat and work being mutually convertible; according to which the small calorie is equal to 426.5 kilogram metres, or 1,400 ft. lbs. in gravitational units, or 4.184×10^7 ergs in absolute units.

Calorimeter is the name given to the apparatus used to determine the specific heat of substances, or the amounts of heat evolved or absorbed in various physical and chemical changes. Calorimeters take very diverse forms, according to the particular kind of determination to be carried out in them, varying from quite simple vessels, if the specific heat of a metal is to be determined by adding it to water at a different temperature, to highly complex apparatus, if the specific heat of gases is to be measured, or the method of fusion or evaporation is to be the basis of the operation. In all such experiments the great difficulty is to prevent loss of heat during the process, and many precautions, such as silvering and polishing, enclosing in non-conducting air and vacuum jackets, etc., have to be taken, and corrections made to obviate errors that might arise in this way. See SPECIFIC HEAT, LATENT HEAT, and THERMOCHEMISTRY.

Calotte, a cap or coif commonly worn over the tonsure by ecclesiastics in France in the 15th and 16th centuries. The name was also applied to the padded cap which knights wore under their helmet, and, during the period of the reformation, to a close-fitting woman's headdress. The word, when used in architecture, designates a flattened dome.

Calottists, a satirical society founded in 1702 by Aymon and Torsac, of Louis XIV.'s bodyguard, and deriving its name from the *calotte*, a small cap worn by priests to conceal their tonsure. Transformed about the middle of the 18th century into a military institution, it was finally suppressed at the revolution. See *Mémoires pour servir à l'Histoire de la Calotte* (1725).

Calovius, or KALAU, ABRAHAM (1612–86), leader of the strict Lutheran party in Prussia, born at Mohrungen, E. Prussia, and after filling a theological chair (1637) at Königsberg, was appointed (1650) to a similar position at Wittenberg, along with the post of chief superintendent. In 1665 he launched his polemical *Consensus Repetitus Fidei Veræ Lutheranæ* against Calixtus, and followed it up with attacks on Socinians, Arminians, and Calvinists. His chief works were *Systema Locorum Theologicorum* (12 vols. 1655–77); *Biblia Illustrata* (1672); *Historia Syncretistica* (1682).

Caloyers, Greek monks of the order of St. Basil. Their rules are severe: flesh foods are forbidden, and their bread must be earned by manual labor. Their most famous monastery is on Mt. Athos. Female caloyers, observing rules similarly strict, form a separate community.

Calpe, the mountainous headland in the S. of Spain, now known as Gibraltar.

Calpurnia. The last wife of Julius Cæsar, who married her in 59 B.C. Her anxiety for Cæsar when the conspiracy was formed against him, and the dream which made her beg Cæsar not to leave his house on the ides of March, have been made famous by Shakespeare.

Calpurnius Siculus, a Roman poet of the 1st century A.D. Little or nothing is known of his life. His works consist of seven eclogues (four others being erroneously attributed to him), or poems of rustic life, closely imitating those of Virgil. His style is elegant, but he is lacking in simplicity and naturalness. Editions: Text, in Baehren's *Poetæ Latini Minores*, vol. iii. (1879–83); Schenkl (1885); with notes, Keene (1887); Eng. verse trans., Scott (1890).

Caltagirone, tn. and episc. see, prov. Catania, Sicily, 42 m. by rail S.W. of Catania; is a well-built town, crowns a couple of hills (2,015 ft.) linked by a bridge, and is a favorite place of residence for the rural nobility of the island. It is famous for its good schools, as also for its pottery and statuettes. Pop. (1901) 44,527.

Caltanissetta. (1.) Province of Italy, in the middle of Sicily. In the N. it rises to an altitude of over 3,000 ft., and is drained by the Salso and other streams. Sulphur, wheat, wine, salt, olives, and other fruits are the principal products. Area, 1,455 sq. m. Pop. (1901) 327,977. (2.) Capital and episc. see of above province, 43 m. by rail N.E. of Girgenti; stands nearly in the middle of the island, on a lofty plateau (1,930 ft.), and has a cathedral, a technical and a mining school, large fairs, sulphur mines, mineral springs, and potteries. Close by is a monastery in the Norman style, built (1153) by King Roger I. Pop. (1901) 43,033.

Caltha, a genus of plants belonging to the order Ranunculaceæ, of which the marsh marigold (*C. palustris*) may be taken as representative. It is the 'cowslip,' used for greens, before it flowers in early spring. Its golden flowers are familiar at the edges of ponds, blooming profusely, and nearly concealing the glossy kidney-shaped foliage. *C. leptosepala* bears white flowers, and *C. purpurascens* has purple stems and rich yellow flowers.

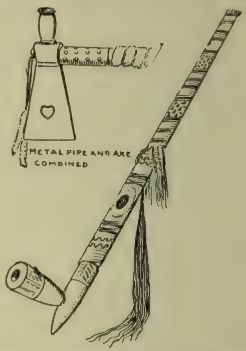
Caltrop (A.S. *calcatrippe*), a small iron ball with projecting spikes; was much used in mediæval warfare, the ground over which an enemy was expected to charge being thickly strewn with them, with the effect that the advancing horses were at once disabled by the sharp spikes piercing their hoofs. The effect was equally disastrous in the case of barefooted infantry. Caltrops were also used by the New England colonists, who placed them in the grass around their villages, as a precaution against Indian attacks. The word is, moreover, applied to plants that catch or entangle the feet; and 'water caltrops' is a name given to the Potamogeton water-plant, because it entangles swimmers.

Caluire et Cuire, tn., dep. Rhône, France, on river Saône, 3 m. N.N.E. of Lyons. It has potteries, nurseries, and essence distilleries. Pop. (1901) 10,926.

Calumba. *Calumbæ radix* is the dried root of *Jateorrhiza palmata*, a lofty herbaceous climbing plant, native of E. Africa. The roots or tubers are brown without and yellow within, and have a bitter taste, due to a substance known as calumbin, and in a lesser degree to berberin, an alkaloid which also occurs in the barberry. Calumba root, in infusion, is used as a stomachic and tonic, the maximum official dose being half a drachm.

Calumet. See LAURIUM.

Calumet, the tobacco-pipe specially known among the Algonquin Indians as 'the pipe of peace,' owing to its distinctive use at a council of warriors assembled for the purpose of concluding peace between their opposing tribes; though it was, in fact, used on all solemn occasions. Custom prescribed that the calumet should be solemnly whiffed by each warrior in turn, and so handed round. Its long stem, formed of wood or reed, was fringed with eagles' quills, the bowl being made of stone. See *McGuire's Report National Museum* (1897, 1899); Dorsey's *Third Report, Bureau of American Ethnology* (1885).


METAL PIPE AND AXE COMBINED

The Calumet or 'Pipe of Peace.'

Calumpit, pueb., Bulacan prov., Luzon, Philippine Is., 27 m. N.W. of Manila, on the Pampanga R., near its delta and near the Manila Dagupan R. R. The region is very fertile. It was burned in the war of 1899. Pop. (1903) 13,897.

Calvados, dep. of Normandy, France, between the estuary of the Seine on the E. and the Cotentin peninsula on the W. Area, 2,132 sq. m. Cap. Caen. Pop. (1901) 410,178.

Calvaert, or CALUWAERT, DENIS, also designated DIONISIO FIAMMINGO (1540–1619), Flemish painter of the Bologna school, born at Antwerp, and studied at Rome under Fontana and Sabbatini. At Bologna he founded a school, which numbered among its students Guido Reni, Albani, and Domenichino. Among the larger pictures by Calvaert the best are: *The Martyrdom of St. Agnes*, in the church of St. Agnes at Mantua; *Paradise*, at Bologna; *The Transfiguration*, at Parma.

Calvary, the scene of the crucifixion of Jesus Christ, is situated close to Jerusalem. The Hebrew name was Golgotha ('skull'), derived either from its having been the place of execution, where bones, etc., were constantly lying about, or from its resemblance to a skull. There is no indication in Scripture that it was a hill at all, and the name Mount Calvary does not go back beyond the 5th century; it is, however, spoken of as a conspicuous place (Mark 15:40; Luke 23:49). Golgotha is traditionally placed to the northwest of the (ancient) city, the spot having, as it was supposed, been discovered by Constantine; and here was erected a church, on the site of which stands the present Church of the Holy Sepulchre. Many Roman Catholic churches have a representation of the crucifixion (Calvary) approached by a Via Dolorosa. See JERUSALEM.

Calvé, EMMA (1866), French operatic singer, whose real name is EMMA DE ROQUER, was born at Madrid; made her début as Marguerite in Gounod's *Faust* (1882). She appeared in London in 1892, at Covent Garden, in *Cavalleria Rusticana*, and in *L'Amico Fritz* as Suzel, a part she had created at Rome. She first appeared at New York in 1893–94, and again in 1895–96, 1896–97, 1899–1900, and on other occasions. Her *Carmen*, and Santuzza in *Cavalleria Rusticana* are two of her most popular rôles in the U. S. Not only is she a remarkably fine singer, with a voice of extraordinary range, but she is also a very capable actress. Among her most noteworthy impersonations are the leading parts in *Carmen*, in Joncière's *Chevalier Jean*, Massenet's *Sapho* and *Navarraise*, De Lara's *Messalina*, and Samara's *Flora Mirabilis*. Other rôles assumed by her are the Countess in *The Marriage of Figaro*, Ophelia in Thomas's *Hamlet*, Leila in *The Pearl Fishers*, and Pamina in *The Magic Flute*. Mme. Calvé's home is an old castle situated in the Cévennes, about 800 feet above the valley of the Tarn, France. She has built on her estate a home for little girls, in ill health or otherwise unfortunate, and placed here under the care of a Catholic sisterhood, to be taught various useful employments.

Calverley, CHARLES STUART (1831–84), English poet, born at Martley, Worcestershire, his surname originally being Blayds. In 1862 he published *Verses and Translations*. He wrote delightfully witty verses in parody of classical and modern poets, and excelled in spirited translation. He published *Fly Leaves* (1872) and a memorial volume entitled *Literary Remains* (1885), to which was appended a biographical sketch by W. J. Sendall.

Calvert, tn., Robertson co., Tex., 83 m. N.E. of Austin, on the Houst. and Tex. C. and the Fort Worth branch of the Int. and Gt. N. R. Rs. It is the trade centre of an agricultural region and manufactures cotton and ice. Pop. (1910) 2,579.

Calvin, JOHN (1509–64), the reformer, was born at Noyon in Picardy. Destined for the Roman Catholic Church, he entered the college of the Capettes, where he displayed extraordinary precocity. At the age of twelve he became chaplain to the chapel of the Gésine. He next entered (1523) at the college of La Marche, under the regent Cordier (Corderius). It was to him that Calvin dedicated his *Commentary on the First Epistle to the Thessalonians*. Passing through the college of Montaigu, he became (1527) curé of Marteville, and subsequently curé of Pont-l'Evêque, his father's native town, in 1529. Obeying his father's instructions, he gave up the study of theology for that of law, at Orleans, and afterwards at Bourges. At Bourges he also learned Greek from Wolmar, read the Greek Testament, and became a Protestant. He went to Paris, and in support of the 'new religion' he wrote a commentary on Seneca's *De Clementia* (1532); but persecution became too strong, and he had to flee to Basel, where, in 1536, he produced the *Institutes of the Christian Religion*. Calvin is next found in Geneva in 1536. Here the courageous Farel entreated him to stay, and Calvin received a ministerial charge and the chair of professor of divinity in the academy. Accused of Arianism by Caroly, he successfully defended himself before the Synod of Bern, and in less than a year's stay in Geneva he procured the renunciation of Roman Catholicism by the public authorities; but over an unhappy schism as to the use of unleavened bread in the celebration of the eucharist, Calvin had to leave Geneva and take refuge in Strassburg, where he was at once appointed pastor of a church and professor of theology. Here he composed his *Treatise on the Lord's Supper*, and an eloquent reply to Cardinal Sadolet, who endeavored to win back the Genevese to the Catholic Church. In 1540 he attended the Diet of Worms, and in 1541 that of Ratisbon, where he was introduced to Melanchthon, who ever after spoke of him as 'the theologian' of the day. In 1541 he returned to Geneva at the public request of the inhabitants, and his system of ecclesiastical discipline, called the Consistory, was established in the city in the same year. He wrote a *Catechism* in Latin and French, and in 1543 he composed a famous liturgy. Next we hear of him engaged in controversy with the decisions of the Council of Trent in a work called *The Antidote*, and in a long correspondence with Luther, Bucer, and other reformers. In 1554 he received a visit from John Knox, which resulted in an intimate friendship till Calvin's death. A slur is cast on the later part of Calvin's life by his treatment of Servetus, a Spanish physician, who was passing (1553) through Geneva, and who is said, at the instigation of Calvin, to have been seized, imprisoned, and consigned by the council to a cruel death. In 1564 Calvin was visited by Beza, and on May 24 of the same year he died. Calvin's views may be summarized thus: (1) particular election; (2) particular redemption; (3) moral inability in a fallen state; (4) irresistible grace; (5) final perseverance. Calvin held the spiritual presence of Christ in the eucharist, and not the doctrine of consubstantiation. His tenets were directly opposed to those of Arminius. That his opinions on predestination and election have been pushed far beyond his own belief by his Calvinist followers may be illustrated by a passage from his will: 'The blood which my sovereign Redeemer has shed for the sins of the *human* race'—not, as they teach, for the elect only. As a theological writer, Calvin is remarkable for clearness, method, and scientific exactitude; as a reasoner, he is distinguished for logical acuteness. According to Scaliger, he stood alone among theologians. Calvinism has long been losing ground in England, and the Scottish Free Church litigation proves that it has largely lost its hold on the Scottish people. A complete edition of Calvin's *Works* was issued in 59 vols. by Braun, Reuss, and Cunitz in 1863–1900. See Paul Henry's *Life and Times of Calvin* (1835); Beza's *Histoire de la Vie et la Mort de Calvin* (1564); and other *Lives* by Bolsec (1616), Masson (1638), Fischer, Doumergue (1899), John Scott (1833), T. H. Dyer (1850), and Bungener (1863). See also Schaff's *History of the Christian Church*, vol. vii., pp. 257–844 (1892).

Calvinia, dist. and vil. in the N.W. province, Cape Colony, stretching to the Orange R.; chiefly inhabited by nomad Boers. Area, 23,800 sq. m. Pop. of dist. 12,255.

Calvinistic Methodist Church. See METHODISM.

Calvi Risorta, vil., prov. Caserta, Italy, see of a bishop, with old cathedral. It is the ancient Cales, celebrated for its wines, praised by Horace. Pop. (1901) 3,308.

Calvo, CARLOS (1824–1906), Argentine historian, born at Buenos Ayres. In 1860 he undertook a diplomatic mission to London and Paris, in 1885 was appointed Argentine minister at Berlin, and in 1899–1905 held the similar post at Paris. His chief works include *Derecho Internacional Teórico y Práctico de Europa y América* (2 vols. 1863; 6 vols. 1887); *Annales Historiques de la Révolution de l'Amérique Latine* (5 vols. 1864–75); *Dictionnaire du Droit International* (1885).

Calycanthus, a genus of hardy deciduous shrubs mostly natives of North America. *C. floridus* (the Carolina allspice) grows to a height of 6 ft., and is fragrant in all its parts. *C. occidentalis* (the sweet-scented shrub of California) is taller, and equally fragrant; it is sometimes known as *C. macrophyllus*. Both have axillary, or terminal, purple-brown flowers with numerous sepals, narrow and spreading. *C. præcox* (*Chimonanthus fragrans*), is the winter sweet, which bears its fragrant brownish-yellow flowers in very early spring. All the kinds may be increased by layers or suckers or by division.

Calydon, a mythical city of Ætolia, the scene of the hunt of the Calydonian Boar, related by Ovid in bk. viii. of *Metamorphoses*. This legend covers also the magic or sacred boar of Gaelic (as of Cymric legend), and the theory has been advanced (*Ossianic Soc. Trans.*, 1860, vol. v. p. 62) that it represents a porcine worship similar to that of Vishnu, in his avatar as a boar. The Teutonic tribes also held the boar as sacred, and Tacitus mentions that among the Æstyi it was the symbol of 'the mother of the gods.' In modern Europe and in China a pig is still the emblem of luck.

Calymene, a genus of fossil trilobites which is very common in Silurian rocks of Europe and N. America.

Calypso, a daughter of Atlas, who lived in the island of Ogygia. Homer tells that when Odysseus was wrecked on her island she wished to keep him with her, but after seven years the order of the gods and his longing for home prevailed on her to let him go. (See *Odyssey*.) Another version of the story, adopted in Fénélon's *Télémaque* (1669), substitutes for Odysseus his son Telemachus.

Calyx, the outer of the four whorls which compose a typical flower, its parts or leaves being known as sepals. When the sepals are joined together, forming a cup, the calyx is gamosepalous; when the sepals are not united, it is called polysepalous. Usually the sepals are green, but occasionally they are of other colors; they are then called petaloid. When the calyx is adherent to the ovary, it is called superior; when not adherent, it is inferior. When the sepals are joined together, the terminal part of each that is unattached is called its limb, the united parts of all the sepals together forming the tube.

Cam, a mechanical device by which the rotary movement of a shaft may be transformed into any required movement of other parts of the machine which engage with the cam. The simplest instance is the excentric on a steam-engine shaft, which communicates a reciprocating harmonic motion to the slide-valve; but cams having peripheries of any required curve, or combination of curves, may transmit the most complex movements.

Cam, riv., Cambridgeshire, England, formerly called the Granta, flows in a N.W. and then N.E. direction. Its total length is 40 m., and it is navigable as far as Cambridge, 15 m. from its union with the Ouse, 3½ m. S. of Ely.

Cam, or CÃO, DIOGO, Portuguese navigator, sent by Alfonso V. of Portugal to continue the explorations of the African coast promoted by Prince Henry; in 1484 discovered the Congo. He also explored the W. African coast from the Congo to the 22nd parallel of S. lat.

Camaguey, a popular name for Puerto Principe prov., Cuba, sometimes extended to the city. It was an old territorial division comprising about four-fifths of Puerto Principe.

Camajore (anc. *Campus Major*), tn., Tuscany, Italy, 12 m. N.W. of Lucca; has olive groves. Pop. (1901) 18,548.

Camajuani, city, Santa Clara prov., Cuba, 20 m. E. of Santa Clara, and 15 m. W. of Caibarien, with which it is connected by rail. Its importance is due to its communications. It has a post office and telegraph station. Pop. (1899) 5,082.

Camaldolites, or CAMALDULENSIANS, an austere order of monks founded in 1012 by St. Romuald at Camaldoli, among the Etruscan Apennines, about 30 m. east of Florence. The monastery at Camaldoli is much visited as a summer resort. Pope Gregory XVI. (1765–1846) belonged to the order. Its habit is white, and the members are compelled to fast during two Lents in the year, and to abstain perpetually from flesh. They are also bound to observe strict silence in all public places.

Camalig, pueb., Albay prov., Luzon, Philippine Is., 5½ m. N.W. by W. of Albay, on the main road. It is an important centre in the hemp industry. Pop. (1903) 14,153.

Camana, seapt., Peru, cap. of the prov. and on the riv. of the same name, situated in a plain, 4 m. from its harbor and 70 m. W.S.W. of Arequipa. Coffee, olives, and sugar are prepared for export. Pop. 6,000.

Camargo, tn., Tamaulipas state, Mex., 100 m. E.N.E. of Monterey and a like distance from the Gulf coast, on the San Juan, near its confluence with the Rio Grande. The mission of San Augustin Laredo was situated here. Pop. 6,815.

Camargue, LA, isl., France, in the Rhone delta. It has an area of 150 sq. m., of which one-third is marshy; but in the rest cereals and wine are grown, and cattle and sheep are grazed. It is protected by dikes against inundation, and the mistral, which blows here, makes it healthier than it otherwise would be. Seabirds abound.

Camarilla, originally the small or audience chamber of a king, but the term has come to mean a royal clique, junto, or cabal of unofficial court intriguers, in contradistinction to the king's regular ministers and advisers.

Camarina, tn. on the S. coast of Sicily, founded as a colony from Syracuse in 599 B.C. It was successively destroyed by the Syracusans (552 B.C.), Carthaginians (405 B.C.), Romans (258 B.C.), and Saracens (853 A.D.). Twice it was recolonized by the people of Gela—in 492 B.C. and 461 B.C.

Camarines, AMBOS, prov., Luzon, Philippine Is., in middle of S.E. peninsula, between Tayabas and Albay, and the Pacific Ocean and the Gulf of Ragay. Area, 3,092 sq. m., and 83 islands 69 sq. m. additional. A chain of mountains, covered with luxuriant vegetation, runs lengthwise and has several notable peaks, among which Isarog (6,450 ft.) is the highest. The province is rich in natural products, including gold. Nueva Caceres is the capital. Pop. (1903), civilized, 233,472; wild, 5,933.

Camass or QUAMASH. An important food of the Indians of the Northwestern United States. It consists of the bulbs of various species of *Quamasia*, a liliaceous genus, frequently found in vast colonies in damp places in the West.

Cambacérès, JEAN JACQUES RÉGIS DE (1753–1824), French statesman, was born at Montpellier. He represented the nobles in the Legislative Assembly (1792), was on the Committee of Public Safety in 1793, and was minister of justice under the Directory. In 1799 he was made second consul in France (with Bonaparte and Lebrun), and afterward became arch-chancellor of the empire and president of the Senate. It was under his direction that the French *Code Civile* was prepared. He was created Duke of Parma in 1808, but on the overthrow of the empire he was exiled till 1818.

Cambaluc, kam-bā-lo͞ok′ (*Khan-Baligh,* 'city of the emperor'), the name by which, during the Middle Ages, Pekin became known to Europe, and rendered familiar by Marco Polo's travels.

Cambay, kam-bā′ (*Khambhát*), port and capital of a small Indian feudatory state of the same name, Bombay Presidency, India; 52 miles south of Ahmedabad. Once a prosperous and important city, it has declined with the silting up of the Gulf of Cambay and the consequent obstruction to its seaward navigation. Its principal industry is the making of agate, cornelian, and onyx ornaments. Many ruins still attest its former magnificence and extent. The population, at one time 200,000, has shrunk to 30,000. The state has an area of 350 square miles and a population of 75,000.

Cambay, Gulf of, a large inlet about 80 miles long and 25 broad, between the peninsula of Kathiawar and the mainland of Bombay; formerly a great commercial resort of Arab traders.

Cam′berwell, parliamentary borough, Southeastern London. Pop. (1911) 261,357. See London.

Camberwell Beauty, a butterfly. See Mourning Cloak.

Cam′bist, a person skilled in the foreign exchanges, hence a dealer in bills of exchange.

Cambium. See Bark.

Cambo′dia, kingdom and French protectorate of Indo-China, bordering on the eastern coast of the Gulf of Siam, situated between Siam on the north and northwest and French Cochin-China and Annam on the south and east. Its area is 67,741 miles, having been increased about 7,000 square miles by territorial acquisitions under the Franco-Siamese Treaty of 1907. The coast, about 160 miles long, forms two bays, Kompong-Som and Kampot, on which stands Cambodia's only haven, Kampot. A little off the coast there stretches a string of islands, most of which are inhabited.

The greater part of the surface of Cambodia is included in the alluvial plain formed by the lower course of the Mekong, which traverses the country, dividing near Pnom-Penh into an eastern and a western arm, while a third arm diverges 70 miles northwest to Tonle-sap or Great Lake, 100 miles long and 5 miles broad.

Natural Resources. — Owing to the periodical inundations, the soil of the plains is remarkably fertile. Sweet potatoes and tropical fruits, from the cocoanut and bread-tree to the guava and banana, flourish luxuriantly. Rice, cotton, sugar-cane, coffee of excellent quality, cinnamon, betel, tobacco (remarkably like that of Manila and Sumatra), indigo, sugar-palm, mulberry (on which silkworms may be reared all the year round), and other industrial plants, prosper. The forests—very extensive and little depleted—are rich in building, joinery, cabinet, and dye woods. Caoutchouc and cardamoms especially abound. The elephant, tiger, panther, rhinoceros, buffalo, wild boar, monkey, and honey bear are included in the fauna. Crocodiles and numerous poisonous reptiles also abound. The rivers teem with fish, and many towns are devoted exclusively to drying and salting fish and manufacturing fish oil.

Iron (the only metal worked) occurs in the province of Kompong-Svai. Limestone is very common. Precious stones (emeralds and rubies) are found in the mountains of Pursat, and coal has been discovered (1880).

Industry and Trade.—Agriculture and fishing are the principal occupations, but there are some manufacturing interests. Sugar is made from the fan palm all over the country, and silk weaving is carried on as a domestic industry. There are factories near Pnom-Penh for the shelling of cotton seeds, to which have been added oil-works for the treatment of the cotton grains. Trade is chiefly in the hands of foreigners and is carried on through Saigon, in French Indo-China. Exports include rice, fish and fish products, haricots, cardamoms, palm sugar, skins, tobacco, cotton, mattresses and mats, silks, cocoons, gamboge, ivory, tortoise-shell, pepper, bamboos, and lime. Salt, sugar, textiles, and arms are imported. Transportation facilities are meagre.

Peoples.—The total population is estimated at 1,500,000, four-fifths of whom are collected in the valley of the Mekong. About three-fourths of the population belong to the Camboja or Khmer race. Chinese and Annamites, each about 11 per cent., are steadily increasing through immigration. The Malays and Chams (Tsiams), along the valley, and to the east of the Mekong, constitute about 2½ per cent., and there are small groups of primitive Cambodians—the Penong, Khois, and Tsiam.

The Cambodians approach the Malay and Indian types, are less Mongoloid and more nearly resemble the Caucasian type than their neighbors. They are tall and robust, copper-colored rather than yellow, the skull elongate, the nose, though flat, more prominent than in the Annamite, and the eyes very slightly oblique. The religion is a development of Buddhism, in which the worship of ancestors forms a large part. Christianity has made little progress.

The Cambodian language has much in common with the other monosyllabic languages of Indo-China, especially those of Siam and Annam. It lacks, however, the varieties of tones, or inflections of voice, by which these discriminate between the different significations of the same monosyllable. The letters are borrowed from the Indian Pali, the parent of all the Indo-Chinese alphabets. Besides the current idiom there is a sort of literary language of Pali vocables used in official ceremonies by the bonzes (monks) and mandarins.

Government. — Cambodia is nominally ruled by its own king, but a French resident-general directs the king's political actions. At the head of each province is a French resident, under whom is a native governor. The foreign policy, exchequer, and public works are controlled by the French, and the police and tax collections by the natives. There is a tribunal of first instance at Pnom-Penh, to decide cases with Europeans, with a court of appeal at Saigon.

History.—As early as the twelfth century B. C. Chinese records mention an independent kingdom called Fou-nan which occupied the same territory as Cambodia, but the Cambodian kingdom seems to have been founded by colonists from India in the early part of the Christian era. It was a flourishing kingdom until the seventeenth century, with a great army and an inexhaustible war treasure. In the seventeenth and eighteenth centuries some of its outlying provinces were annexed by Siam and Annam and its glory steadily declined. In 1864 Siam was compelled to abandon all claims to Cambodia and it placed itself under the protection of France. In 1884 this protectorate was formally recognized by King Norodom. The present King Sisowath came to the throne in 1904.

Antiquities.—A most remarkable feature of Cambodia is the splendid ruins of Khmer architecture. The great piles explored number over fifty, while the smaller isolated structures are counted by the hundreds. The temple of Angkor-Wat occupies a larger area than that of Karnak in Egypt, and just as vast are the monuments of Préa-Khan (near Angkor), of Méléa, and of Pontéay-Chma. Those of Baion, Préa-Khan (province of Kompong-Soai), Ta-Prohm, Ka-Kéo, and Ek-dey constitute likewise immense groups. Among the ruins are also massive stone bridges so solidly constructed as to have almost all resisted the periodical inundations and shock of huge tree-trunks hurled against them. The bridge of Spean-Tenk measures 470 feet in length, and has 34 arches.

Bibliography.—Consult Garnier's *Excursions et Reconnaissance* (vols. viii and xiii); Vincent's *The Land of the White Elephant;* Hannah's *Brief History of Eastern Asia;* and Aymonier's *Le Cambodge.*

Cambodia River. See MEKONG.

Cambon, kän-bôn′, JULES MARTIN (1845), French diplomat, was born in Paris. He served in the Franco-Prussian War, reaching the grade of captain, and after the war was appointed (1871) auditor of the provisional committee which succeeded the Council of State. He was made director-general in the civil service of Algeria in 1874, and governor-general of that colony in 1891. From 1897 to 1902 he was French ambassador at Washington, and during that period acted as intermediary between Spain and the United States at the close of the Spanish-American War. He was ambassador to Spain in 1902, and to Germany from 1907 to 1913. During the Great War he served as General Secretary to the Foreign Office, as adviser to the Foreign Office on Franco-American relations and on matters concerning Alsace-Lorraine, and as one of the French delegates at the Peace Conference. He was elected a member of the French Academy in 1918.

Cambon, PIERRE PAUL (1843), French administrator and diplomatist, brother to Jules Cambon (q.v.), was born in Paris. He was secretary of the prefectures of Alpes-Maritimes and Bouches-du-Rhône; and prefect of the Aube, the Doubs, and the Nord. He entered the diplomatic service in 1882 as minister to Tunis, became ambassador at the court of Madrid in 1886, and at Constantinople in 1891. He was named ambassador to Great Britian, an office which he still (1919) maintains.

Camborne, kam′bôrn, parliamentary and market town, West Cornwall, England, 3 miles southwest of Redruth. It has tin, copper, and lead mines. Pop. (1911) 15,829.

Cambrai, kän-brā, town, Northern France, department of Nord, on the River Scheldt; 32 miles south of Lille. It has an ancient citadel, a belfry dating from the fifteenth century, a fine nineteenth century cathedral containing a monument to Fénelon, archbishop of Cambrai from 1695 to 1715, and other modern buildings. It is famous for its fine linen textiles, or cambrics, invented and first manufactured here by Baptiste Coutaing in the fifteenth century. Other industries include tanning, brewing, distilling, sugar mills, and manufactures of linen thread, wool, flax, and soap. Pop. (1906) 21,791.

Camaracum, the ancient Cambrai, was one of the chief cities of the Nervii. It was fortified by Charlemagne, and was long governed by its own bishops, to whom the emperor Henry I. ceded it. Taken by the Spaniards in 1595, it was delivered to France by the treaty of Nimeguen (1678). The celebrated League of Cambrai against the republic of Venice, which comprised the pope, the emperor, and the kings of France and Spain, was entered into here in 1508 and here was signed the peace between Charles V. and Francis I. in 1529.

In the World War (1914–19) Cambrai was of special strategic importance as the converging point of four railways and numerous highways. It was occupied by the Germans in the early days of the War and was an important distributing station for the German armies. It was the objective of the great British drive begun on Nov. 20, 1917, but remained in the possession of the enemy until the autumn of 1918, when it was taken by the British (Oct. 9, 1918) in the Cambrai-St. Quentin advance (see CAMBRAI, BATTLES OF).

Cambrai, Battles of. ***First Battle.***—With the close of the protracted and costly operation of the Third Battle of Ypres (q. v.) on Nov. 6, 1917, the British High Command faced a serious situation. The Germans had brought large forces to the Western front from Russia, more were on their way, and there were many more to come. If the enemy were left in peace, he had it in his power to create a dangerous situation in the spring of 1918. Moreover, Italy, fighting desperately on the Piave, by all the laws of war deserved some relief in the shape of an Allied diversion. The operations at Passchendaele had compelled the Germans to concentrate heavily on the threatened front and reduce their strength in other sectors. Haig reckoned that if he could strike at once in an unexpected quarter, he might have the benefit of a real surprise and possibly break the rigidity of trench warfare with a marked effect upon the *morale* of the enemy, who would not anticipate a fresh Allied effort at this time.

Having decided on the policy of a surprise attack, Haig found in that sector of the old Siegfried Line which lay in front of Havrincourt Wood, between the Bapaume-Cambrai road and the Scheldt Canal, an area which offered many advantages. The place was very thinly held by the enemy, and, any considerable British advance would endanger a vital part of the enemy's front, and seriously hamper his communications. Cambrai, a main centre, would be brought under the British guns, as would the great lateral railway which ran through it. The heights of Bourlon would also command the Arras-Cambrai road, and take in the rear the German positions in the southern part of the Drocourt-Quéant line and the Sensée valley.

The Cambrai sector from Bullecourt to the Oise was held by Von der Marwitz's second German Army, which at that time had only eleven divisions in line. In the threatened area it had only three divisions and three more in reserve. The British force was Allenby's Third Army, now commanded by Sir Julian Byng, which had not been seriously engaged since the Battle of Arras (q. v.) in the spring. On the six-mile front of the main attack, Byng had six divisions in line, also two divisions detailed for a subsidiary attack on the left, and a division in support in the main area. The mounted forces at his disposal were four cavalry divisions.

The German defences were complicated and strong. First came the forward positions in the nature of outposts at the ridge of La Vacquerie and at the northeastern corner of Havrincourt Wood. Behind lay the Siegfried Line proper, running northwest to Havrincourt from the Scheldt Canal at Banteux—a line with especially wide trenches to prevent the passage of tanks. A mile or more behind that lay the famous Siegfried Reserve Line, tunnelled to a great depth and heavily wired. Between three and four miles to the east ran the final German position covering Cambrai from Beaurevoir by Masnières to Marquion.

At twenty minutes past six on the morning of Nov. 20, 1917, a single gun broke the silence.

It was the signal, and just north of the Bapaume road to the hamlet of Gonnelieu in the south a long line of tanks crept forward into the fog, their commander, Gen. Hugh Elles, leading them in his 'flagship.' Gas and smoke were released everywhere from the Scarpe to St. Quentin, and in front of the tanks a dense smoke barrage blinded the enemy's guns. The British artillery broke loose and deluged the German rear with shells, while behind the tanks quietly and leisurely moved six divisions of assault. At Epehy on the south, and at Bullecourt on the north, the subsidiary attacks were launched at the same moment.

The enemy was taken utterly unawares. The tanks cut great lanes in his wire, broke up his machine-gun nests, and enfiladed his trenches, while the British infantry followed to complete the work. At once the outposts went, the main Siegfried Line followed soon, and shortly thereafter the fighting was among the tunnels of the Reserve Line. By half-past ten that also had vanished, and the British troops, with cavalry close behind, were advancing to their final objectives in open country. In the meantime the Twenty-ninth Division, which had been in support, pushed through between the Sixth and Twentieth Divisions as a spearhead, taking Marcoing and Neuf Wood, and turning south entered Masnières, but not before the enemy had managed so to weaken the bridge over the canal that the first tank which tried to cross fell through. They had trouble in the north end of the village, with the result that the Germans had the chance to occupy Rumilly and the sector of their final line of defence south of it. This delayed what might have been the final blow to the enemy defence, for had the cavalry been able to cross the canal in force there was little between them and Cambrai.

The day closed with a remarkable record of success. The subsidiary attacks captured the remainder of the Siegfried Line at Bullecourt with 700 prisoners. On the whole front over 5,000 prisoners were brought in. Byng had carried the outposts, the Siegfried Line, and the Siegfried Reserve Line on most of his front, and had broken into the final lines at Masnières. He had won nearly all his objectives; but at three points, and vital points, he had not succeeded. He had not yet got Rumilly and Crèvecœur, and so had not obtained that defensive flank which he needed for his swing to the north. Nor had he won the crossing of the Scheldt Canal, and breached the final line widely enough to let the cavalry through, for which the destruction of the bridge at Masnières and the check of the Fifty-first Division at Flesquières village were to blame. The last also prevented the attainment of the most important objective of all, the Bourlon Ridge, the garrison of which was re-inforced. The first shock of surprise had passed, and the chance for cavalry was gone.

The attack was continued next day. By 8 A.M. Flesquières had fallen and by 11 A.M. the final German line had been breached to the north of Masnières. The enemy counter-attacked from Rumilly but were beaten off, and at Noyelles part of the Thirty-ninth Division and dismounted regiments of the First and Fifth cavalry divisions were hotly engaged during the day. On the extreme right the attack on Crèvecœur was hung up by machine-gun fire at the canal crossings. On the extreme left, the Thirty-sixth Division, pushing north of the Bapaume road, got into the outskirts of Mœuvres, where they found a stiff resistance. But the vital point was on the left centre, where the Fifty-first and Sixty-second Divisions, assisted by tanks and squadrons of the First cavalry Division, were struggling desperately towards Bourlon. Anneux, Cantaing, and Fontaine-Notre-Dame were taken, but Bourlon Wood itself was a machine-gun nest which barred the infantry advance, though a few tanks penetrated some way into its recesses.

By this time the enemy's reinforcements were hurrying up from Lens and Flanders. The three vital points—Rumilly, Crèvecœur and Bourlon—had not been gained. Haig decided to view the action thus far as a substantive battle and press for a decision. Beginning Nov. 23, the greatest effort for the next few days was made to take the Bourlon Wood and village, and by Nov. 27 both places and Fontaine - Notre - Dame had changed hands six times, although at that time the British held a strong position on the Bourlon Ridge. To the south the Twelfth Division had won ground in the Siegfried Line northwest of Bullecourt. In the week's fighting the British took over 10,500 prisoners and 142 guns, and carried 14,000 yards of the main Siegfried Line and 10,000 yards of the Reserve Line. They held a salient formed like a rough rectangle some 10 miles wide and 6 miles deep, but it was awkwardly placed, as neither the positions to north nor east which would have made it secure had been won. During the week, also, the enemy by means of fine communications had been hurrying up troops for a counterstroke.

Cambrai had beyond a doubt startled the German High Command, who realized that only by the narrowest margin had they escaped a catastrophe. By Nov. 29 sixteen fresh German divisions had arrived. The British being aware of this, took measures to prepare for the worst by bringing up fresh reserve divisions to replace and support their exhausted troops, and by placing additional machine-guns. Nevertheless, the enemy secured a tactical surprise. Ludendorff planned to strike hard on both flanks and press in the centre. On his right he hoped to win the line Flesquières - Havrincourt, and on his left Ribecourt-Trescault - Beaucamp - Gouzeaucourt, and so nip off all the British troops in the front of the salient. Twenty-four divisions, the bulk of them fresh, were used for the attempt. He used also his new tactics, designed on the Eastern front and first practiced at Caporetto.

At 7.30 A.M. on Nov. 30, a storm of gas shells broke out on the 10 miles between Masnières and Vendhuille. There was no steadily advancing barrage to warn of the enemy's approach, but the thick mist enabled his infantry to approach the British trenches while they were still under cover. The result was that the line from Bonavis Ridge to Vendhuille was overwhelmed and at 9 A.M. the enemy were in Gouzeaucourt.

The situation was saved by the Twenty-ninth Division at Masnières, which did not yield ground but beat off attacks, though covered by the enemy on flank and rear. Its heroic resistance defeated the German plan of a frontal assault and gave Byng time to attend to his broken right wing, where the Guards came into action at midday, filling out the gap at Villers Guislain, retaking Gouzeaucourt and completing the linking up of the line at La Vacquerie after hard fighting on St. Quentin Ridge. In the meantime, the greater part of the enemy's force had hurled itself against the front between Mœuvres and the Scheldt Canal after a severe preliminary bombardment followed by a barrage. A little after 9 A.M. the German infantry came on in wave after wave, so that by evening as many as eleven waves had advanced in one area. The fiercest thrust was at the Bourlon Wood, but the assault failed by evening of the same day.

The battle, however, was not over. On Dec. 1 the British Guards advanced, captured the St. Quentin ridge and entered Gonnelieu, while further south, with the help of tanks and the dismounted Ambala brigade of Indian cavalry, they took Gauche Wood but failed to enter Villers Guislain. There was heavy fighting, also, at Bourlon and Marcoing; and at Masnières the Twenty-ninth Division beat off no less than nine attacks. But the Masnières position, with the Bonavis Ridge in the enemy's hands, was precarious and that night the Twenty-ninth Division withdrew to a line west of that village. On Dec. 2 and 3 there was a further withdrawal, until the British occupied a position west of the Scheldt Canal near Marcoing. The new salient was in grave danger, though little happened for the next two days. The enemy strength seemed to be exhausted. It became clear to Haig that he must regain the Bonavis Ridge to make his positions secure, but that meant a new and severe engagement for which he had not the troops. Consequently he gave up the Bourlon position for which his troops had so gallantly fought. The shortening of the line began Dec. 4 and was completed by the morning of the 7th. The new front, which in its northern part corresponded roughly to the old Siegfried Line, ran from the Canal du Nord, along the Welsh Ridge to La Vacquerie. South of that it ran west of Gonnelieu and Villers Guislain, rejoining the old front at Vendhuille. For some days there was local fighting but the battle was over, and by the end of the year the Cambrai front had returned to the normal winter activity.

Viewed in the light of the central strategy of the war, Cambrai effected nothing. It was a brilliant feat of arms, but it had no real bearing upon the fortunes of either combatant.

Last Drive on Cambrai.—When the last advance against the German defences which finally broke them up before its hammer blows and thus ended the European War (see EUROPE, GREAT WAR OF) was set in action, the British Third Army under Byng lay before Cambrai; to his left was Horne's First Army before Douai; and on his right before St. Quentin (q. v.) lay Rawlinson's Fourth Army, to which the Second U. S. Corps (Twenty-seventh and Thirtieth Divisions) had been assigned. Opposed to the British in this area were the German Seventeenth Army under Otto von Below, in front of Douai and Cambrai, and the Second Army under Von Carolwitz to St. Quentin. The strategy of this last assault was that of a general pressure on all parts of the salient of the Western front; the vital elements were the attacks of Pershing and Gouraud in the south and of Haig in the centre. The first made retreat imperative and the second destroyed the machinery of retreat.

The first day of the assault, Sept. 26, 1918, Pershing and Gouraud struck a smashing blow against the German right. The next Haig struck towards Cambrai. The defense here was the Siegfried zone, of which the northern limits formed the southern end of the water-line protecting Douai. North and south of Mœuvres the enemy had the Canal du Nord as an extra defence to cover that gap between the water-line and the Scheldt Canal, which offered an approach to Cambrai. But the strongest part of the zone was opposite Rawlinson's front between St. Quentin and Bantouzelle, where the Scheldt Canal formed the outworks of the system. The principal German trenches were on the east bank, but on the west bank lay advanced posts skillfully sited, so as to deny the attack effective artillery positions. The canal gave cover for resting troops and shelter to the garrisons of the outpost line during bombardment. From Vendhuille south to Bellicourt the canal passed through a tunnel 6,000 yards long, which was connected by shafts with the trenches above. North of Vendhuille the canal lay in a deep cutting, the sides of which were honeycombed with dug-outs and the edges studded with armored machine-gun emplacements. From Bellicourt south to Bellenglise the cutting became shallow, till at the latter place the canal was almost on the ground level, while south of Bellenglise it was dry. From there southward the enemy had two heavily wired trench lines, nearly a mile west of the canal, while north of Vendhuille his positions were on the east bank. These were, so to speak, the outpost and battle zones of the system; but it ran back for a distance of from five to seven miles, a belt of country containing many subsidiary lines and numerous fortified villages, and culminated in what was known as the Beaurevoir-Fonsomme line, a double row of trenches analogous to the front position. East of that there was open country.

Haig had selected the southern section between Vendhuille and Holnon, held by the Fourth Army, as the main area of attack. But there the Siegfried defences were at their strongest, and a long 'preparation' was necessary. He therefore decided to attack first with the First and Third Armies from Vendhuille north to the water-line in order to puzzle the enemy as to the quarter in which the chief blow would be delivered, and to enable the two armies to get forward so as to simplify Rawlinson's task. On the night of Sept. 26, a heavy bombardment opened between St. Quentin and the Sensée. At 5.30 A.M. on Sept. 27, Byng and Horne advanced on a front of thirteen miles, between Gouzeaucourt and Sauchy-Lestrée. The key of the problem was the *debouchment* on a narrow front in the Mœuvres area, for the Canal du Nord north of that place was too strong to be pressed in the face of the enemy. But if the canal could be crossed there, the northern sector might be turned by an attack fanning out from the bridgehead. This task was entrusted to the Sixty-third Division, and the Fourth, Third, and First Canadians. Just at dawn these divisions stormed the canal and swung forward on Graincourt, Anneux and Bourlon—the storm centre of the First Battle of Cambrai—all of which were taken by evening. On the right the Fifty-seventh and Fifty-second Divisions were east of Anneux and close upon Fontaine-Notre-Dame. Further south the Guards and the Second Division took Ribécourt and Flesquières, while the Fifth and Forty-second Divisions had established a flank between Ribécourt and Beaucamp. In the left centre the First Canadians and the Eleventh Division had taken Sains-lez-Marquion, Haynecourt, and Epinoy, and on the extreme left the Fifty-sixth Division was in part across the canal and moving towards Palluel. That evening the British had taken over 10,000 prisoners and 200 guns; and they were everywhere across the Canal du Nord and close on the Scheldt Canal south of Cambrai.

Next day Fontaine-Notre-Dame, Marcoing, and Gouzeaucourt fell, and at Marcoing the British reached the east bank of the Scheldt Canal, while further north Sailly, Palluel and Aubencheul-au-Bac had been entered. Cambrai was now menaced on two sides, and the defences ot the gap had been destroyed. The great road-and-rail junction was out of action, and Douai was also threatened by the turning of its water-line on the south. Worse still, the crossing of the Canal du Nord by tanks on the back of tanks, and the passing of the Scheldt Canal at Marcoing, had broken Ludendorff's confidence in his outer Siegfried defences. He was now hotly engaged in two vital sectors and having no general reserves, and unwilling to take troops from Rawlinson's front, he could look only to St. Gobain and the Aisne sections or to Von Armin and Von Quast in the north for aid.

On the twenty-ninth New Zealanders cleared Welsh Ridge and took La Vacquerie; the Sixty-second Division took Masnières on their left, crossed the Scheldt Canal east of Cantaing, and reached the southern skirts of Cambrai. Farther north the Canadian Corps took St. Olle and Sancourt, and reached the environs of Cambrai from the northwest. Already both Cambrai and St. Quentin were gravely outflanked. The next day the German resistance stiffened at Cambrai, but the Canadians, advancing slowly, were in the suburbs of Proville and Tilloy.

On Oct. 1, Byng advanced on his right, the Third and New Zealand Divisions took Crèvecœur and Rumilly. The Canadians were still battling fiercely in the northern and western skirts of Cambrai.

The position on Oct. 7 was as follows: Haig had crossed the Canal du Nord and the Scheldt Canal; he had broken through all the front Siegfried Line and was pressing upon the last defences, in one section being actually beyond them. The time was ripe for a great movement on the broadest possible front which should destroy the whole zone beyond which lay nothing but the natural obstacles of a wooded and well-watered country between the British army and Maubeuge.

The great movement was begun on Oct. 8 by Haig. Byng and Rawlinson attacked on a 17-mile front from south of Cambrai to Sequehart, while Debeney extended the battle four miles farther south. The Germans resisted desperately, but no gallantry had power to stay the rush of the Allied infantry and the deadly penetration of their tanks. The whole Siegfried zone disappeared in a cataclysm. Byng's New Zealanders took Lesdain and Esnes; the Third, Second, and Sixty-third Divisions took Searnvillers, Forenville and Niergnies; while on Byng's extreme left the Fifty-seventh Division forced their way forward into the southern part of Cambrai, which the Germans had previously set on fire. By evening Haig and Debeney had advanced between three and four miles, and the Siegfried zone was no more. The enemy was falling back to the Oise and the Selle, and for a moment his organization had been broken. Every road converging upon Le Cateau was blocked with transports and troops, and the Allied cavalry galloped forward to confuse the retreat.

During the night the Canadian Corps forced their way at last into Cambrai from the north, and joined hands with the Fifty-seventh Division. The next day, Oct. 9, Byng and Rawlinson again advanced and pressed the retreat. Cambrai was occupied and the Canadians pushed three miles east of the town. Bohain was taken, Caudry was outflanked, and the British advance guards were within two miles of Le Cateau, the old battle field where on Aug. 26, 1914, Smith-Dorrien and the Second Corps had saved the British Army. See EUROPE, GREAT WAR OF.

Cam'bria, the Latin name of Wales, derived from the Celtic Cymry, and originally applied to both Wales and the Cymric kingdom of Strathclyde, but now restricted to the principality. See WALES.

Cambrian System, the name given to the great series of sedimentary deposits which come next in order of succession to the Archdæan System.

In North America the Cambrian or Primordial system comprizes an upper series of shales and sandstones (Acadian series), and a lower one of sandstones, etc. (Potsdam series). These strata have been recognized in Newfoundland, Nova Scotia, New Brunswick, and Canada, and in the States of Massachusetts, Vermont, and New York. They appear also in many different places along the Appalachian chain, also round the Great Lakes and in several areas in the far western States, especially in Utah, Nevada, and in the Grand Cañon of the Colorado.

The British Cambrian rocks are best developed in Northern Wales, and are also well represented in Shropshire, etc. They consist largely of coarse red and purple graywackes, sandstones, grits, and conglomerates, and grayish-blue and green slates and slaty shales; and the same general character is maintained by the rocks of this system in other parts of the world. In Ross-shire and adjoining districts in the northwest of Scotland certain dark reddish-brown conglomerates and sandstones are found overlying unconformably the Archæan rocks of that region, and are themselves covered unconformably by Silurian strata. They form the pyramidal-shaped mountains of Suilven, Canisp, and Coulmor. Cambrian strata with a few fossils have also been recognized in the southeast of Ireland, where they attain a thickness of 14,000 feet at least.

The Cambrian strata are for the most part unfossiliferous—organic remains being met with chiefly in the higher members of the system. Remains of plant life occur sparingly if at all. Animal life, however, is surprisingly well represented, as by sponges (Protospongial), sea-lilies (Dendrocrinus), cystideans (Protocystites), and star-fishes (Palæasterina). Worm-burrows and worm-castings often abound, and crustaceans are plentiful—the modern groups of Ostracods (water - fleas) and Phyllopods (brine-shrimps, etc.,) being represented. The most notable crustaceans, however, are the Trilobites, some of which were very minute and blind (agnostus), while others attained a length of one or two feet. (Paradoxides). The Brachiopods belong almost exclusively to the 'inarticulate' group—the three most characteristic forms being Lingulella, Discina, and Obolella. Four out of the five classes of Molluscs now existing appear in the Cambrian — *viz.*, lamellibranches, pteropods, gasteropods, and tetrabranchiate cephalopods. The last are represented by straight and curved chambered shells (Orthoceras, Cyrtoceras) which belong to the family of the Nautilidæ. The lamellibranchs and gasteropods, which attain their maximum in our own day, appear to have been but sparsely present in the seas of Cambrian times, but some of the gasteropods, such as the snail Pleurotomaria, are types still living. The same, it may be remarked, is the case with some of the brachiopods (Lingulella, Discina), which have persisted to the present day.

Cambrian rocks have been recognized in various other parts of Europe, as in Central and Southern Sweden, where the strata are not nearly so thick as in the British area. In Central Brittany and in the Ardennes they are likewise represented, and they also come to the surface in several provinces of Spain. The most important continental area in Europe, however, is that of Bohemia.

Cambric. See LINEN.

Cambridge, kām'brij, capital of the English county of the same name, and site of Cambridge University (q. v.), is situated on the river Cam, about 55 miles northeast of London. Besides the University buildings and grounds, features of interest are the Guildhall; Addenbrooke's Hospital; St. Sepulchre's, the oldest of the four round churches in England; Great St. Mary's, the university church, a fine specimen of Perpendicular Gothic; St. Benedict's, the oldest building in Cambridge and an excellent example of Saxon architecture; the Perse School, a free grammar school for boys; and Parker's Piece, the playground of Cambridge.

During the Roman occupation Cambridge was known as Grantbridge. It was burned by the Danes in 870 and again in 1010. In 1068 William the Conqueror erected a Castle for military operations on what is known as Castle Hill, but all traces of it have disappeared. Stourbridge Fair, granted to the town by Queen Elizabeth, was, until the eighteenth century, the most important and flourishing market in England. Pop. (1914) 59,159.

Cambridge University, one of the two ancient universities of England, probably dates from the twelfth century, though the year and mode of its establishment are undetermined. One legend runs that it owes its origin to Cantaber, a Spanish prince, brother of Partholin, the king of Ireland, who brought philosophers and astronomers from Athens as early as 300 B.C.; while another gives the credit of its foundation to King Sigebert of East Anglia in 635. The generally accredited account is that the Abbot of Croyland, who had been educated at the University of Orleans, brought with him to Cambridge, in 1110, four monks well instructed in philosophical problems, who taught their sciences in a hired barn and in a short time attracted a large following of scholars. The friars and other religious teachers of the time assisted them, and they soon formed themselves into an association or university. The letters patent addressed to the mayor and burgesses of the town by Henry III. in 1231 are the earliest documents which can be regarded as a university charter.

The university as a corporate body consists of the chancellor, the masters, and the scholars. The chancellor, usually a nobleman of high rank, is the chief executive officer. The governing body (called the senate) consists of the chancellor, vice-chancellor, doctors of divinity, law, and medicine, science and letters, doctors of music, bachelors of divinity, and masters of arts, law, surgery, and music, The university sends two representatives to Parliament, elects the chief officers and examiners, and sanctions all degrees. The resident members of the senate annually elect one of the heads of colleges (masters) as vice-chancellor, through whom the chancellor generally acts. They also elect 'the council of the senate,' a most important body of sixteen persons, which initiates all legislation, nominates the syndicates and persons by whom university business is carried on, and has a veto on every degree.

The colleges are separate corporations independent of each other, and, in most things, of the university. The head of King's College is called the provost, the head of Queen's College the president, the head of every other college the master. Fellows are those who have been co-opted into the governing body of the college. By recent legislation certain fellowships—one or more in every college—have been appropriated to university professors, and the colleges are required to pay a proportion (now more than a tenth) of their net income into the common fund of the university. The university has very little income of its own. Its revenues are derived chiefly from fees for matriculation, examination, and degrees, and from the taxation of the colleges.

Members of the student body are of three classes: the scholars, chosen by examination and having certain privileges; the pensioners, who pay for their board and lodging and constitute the great majority; and the sizars, or poorer students who pay smaller fees and receive their commons gratis. The academic year is divided into three terms. The method of tuition consists of the lectures, classes, weekly papers, and examinations. Special written examinations for honors, called *triposes* from the three-legged stool or tripod occupied in former times by the one to be examined, are as follows: Mathematics (established 1747); Classical (1822); Moral Science (1851); Natural Science (1851); Law (1858); Theological (1874); Historical (1875); Mediæval and Modern Languages (1886); Mechanical Science (1894); Oriental Languages (1895); Economics (1903).

The University confers the degree of bachelor, in arts, divinity, law, medicine, music and surgery; of master, in arts, law, music, and surgery; of doctor, in divinity, medicine, music, science and letters.

The colleges, seventeen in number, are as follows:

Peterhouse, or *St. Peter's,* the oldest college, was founded in 1284 by Hugh de Balsham, subprior of Ely. The quadrangle was begun in 1424, and in 1590 Dr. Perse bequeathed his books and money to build a library. Dr. Matthew Wren, in 1628 built the chapel. The Gisborne court was added in 1825. Peterhouse is one of the small colleges. It has 11 fellowships and 23 scholarships.

Clare College was founded in 1326 by Dr. Richard Badwe, under the name of University Hall. In 1338 Elizabeth, Countess of Clare, founded her college, and in 1340 obtained possession of University Hall and decreed that it should be known as 'House of Clare.' It consists of a single court, and is perhaps the most elegant building in Cambridge. It has 18 fellowships and 31 scholarships.

Pembroke College was founded in 1347 by Marie de St. Paul, widow of Aymer de Valence, Earl of Pembroke. It was the first collegiate house to be built, not adapted from existing buildings. The entrance gate, the chapel (the earliest built for any college), and two sides of the original quadrangle still remain. The hall, combination room, and master's lodge were destroyed, and were rebuilt in 1870–5 by Waterhouse. The second court was built in 1633–59: its chapel was built (1663–5) by Bishop Wren, after a design by his nephew, Sir Christopher Wren; and the new building east of the master's lodge was built (1883) by the younger Scott. Trinity alone outshines Pembroke in the fame of its scholars. It has 13 fellowships and 34 scholarships.

Gonville and Caius College, founded in 1348 by Edmund Gonville, rector of Terrington, Norfolk, was removed to its present site in 1352, and refounded in 1557 by Dr. John Kaye, or Caius, one of the great physicians of the sixteenth century, who, in 1565, built the second or Caius court to the south of Gonville's court, which contained, besides chambers, the hall, library, master's lodge, and chapel. He directed that the south side of the court should be left open for ventilation and light, thus showing himself 300 years in advance of his time. Till 1868, when the first or tree court was rebuilt by Waterhouse, the college was entered from Trinity Street through a small doorway called the Gate of Humility. Caius has always been the great medical college of Cambridge, and its character is partly maintained by the Tancred medical studentships. Dr. Harvey, the discoverer of the circulation of the blood, was educated here. There are 22 fellowships, and 36 scholarships.

Trinity Hall, founded in 1350 by William Bateman, bishop of Norwich, for the study of the canon and civil law, has three courts. The library contains a very valuable collection of law books, and has retained its ancient aspect better than any in the University. There are 13 fellowships and 12 scholarships.

Corpus Christi, or *Benet College,*

was founded in 1352 by the town guilds of Corpus Christi and the Blessed Virgin Mary on the site previously occupied by Gonville Hall. The old court, built by the guilds, was the first closed quadrangle constructed in Cambridge, and is the oldest collegiate structure still remaining. A gallery connects it with the neighboring church of St. Benedict (Benet's), which for a long time served as the college chapel. The new court was built by Wilkins (1823–7). The glory of the college is the library, which contains the unique collection of manuscripts collected by Archbishop Parker, master from 1544 to 1553, and the Lewis collection of coins, gems, vases, and plate. There are 12 fellowships and 31 scholarships.

King's College was founded by King Henry VI. in 1441, but, when in 1443 he enlarged the scope of his foundation, it was connected with Eton. The first stone of the chapel was laid in 1446, but the high altar was not put in place until 1545. The fellows' building, by Gibbs, was erected in 1724; the hall, library, provost's lodge, and screen, by Wilkins, in 1824; Scott's building in 1870; and Bodley's building in 1893. The provost had within the precinct 'all manner of spiritual and temporal jurisdiction,' including the probate of wills. Until 1857 students claimed and received the B.A. degree without submitting themselves to the examinations required by the other colleges. Of the buildings intended by the founder, the only one completed was the chapel, which has been described as 'one of the rarest fabrics in Christendom.' It is one of the finest and most complete Perpendicular buildings in the country, and is particularly noteworthy for the magnificent glass in the twenty-six windows, the lofty fan vault of stone, and the rood or organ screen which separates the choir and antechapel. There are 46 fellowships and 48 scholarships.

Queen's College, founded in 1448 by Andrew Doket under the patronage of Margaret of Anjou, queen of Henry VI., and refounded in 1465 under that of Elizabeth Woodville, queen of Edward IV., was built of red brick, after the plan of the manor-house, Haddon Hall. The gallery over the cloister, a singularly beautiful specimen of British architecture of the 16th century, connects the president's lodge with the western range, and contains many valuable pictures. Other interesting features are the sun dial on the clock tower, said to have been made by Sir Isaac Newton, and an ancient wooden bridge across the river. The new chapel was built in 1891. There are 14 fellowships and 18 scholarships.

St. Catherine's College was founded in 1473 by Robert Wodelarke, third provost of King's College. Nothing remains of the original buildings. Dr. Eachard, master from 1675 to 1697, began to rebuild the present main court, while the chapel, consecrated in 1704, was extensively restored in 1896. The new master's lodge was built in 1875. There are 9 fellowships and 26 scholarships.

Jesus College was founded in 1497 by John Alcock, bishop of Ely, its plan following the arrangement of the Benedictine nunnery of St. Radegund, on the site of which it stands. The chapel, restored in 1846, is cruciform with a central tower and windows of stained glass by Burne-Jones and Morris (1873-7). There are 16 fellowships and 32 scholarships.

Christ's College, originally founded in 1439 by William Byngham, under the name of 'God's House,' was enlarged and practically refounded (1505) by Lady Margaret Beaufort, mother of Henry VII. The first court was probably completed by the foundress before her death in 1509, while the hall was rebuilt in 1876 by the younger Scott. In the second court stands the fellows' building (1640–2), partly built by Inigo Jones, and called by Evelyn

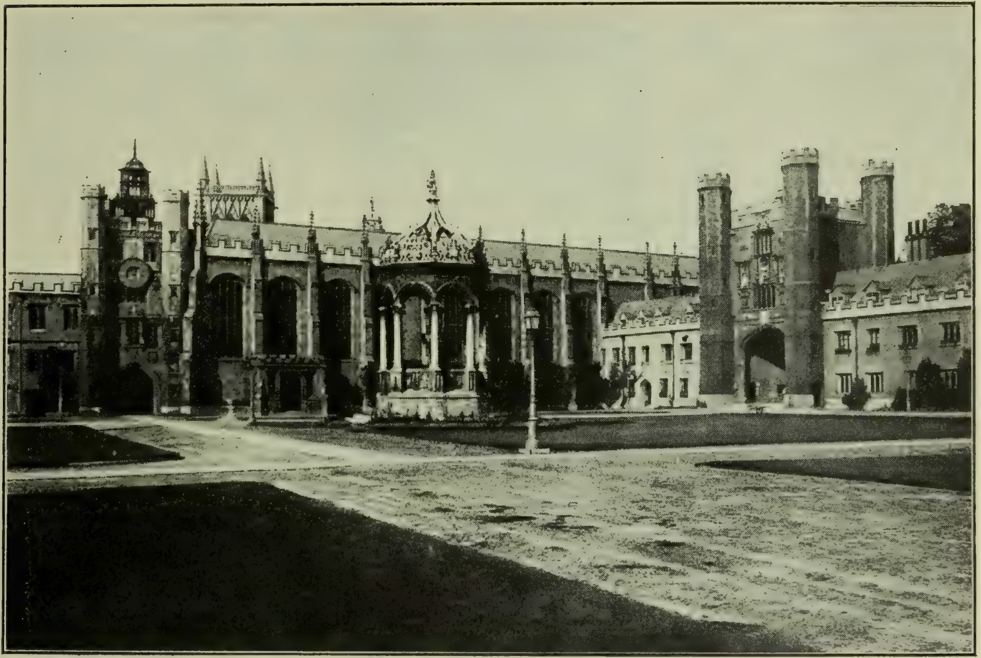


Photo by Brown Bros.

Trinity College, Cambridge.

'a very noble erection . . . of exact architecture.' Beyond this building is another, similar in style, erected (1888–9) by Stevenson. The college offers 15 fellowships and 30 scholarships.

St. John's College, the second foundation of the Lady Margaret, who in her will (1510) suppressed the hospital of St. John the Evangelist (founded in 1135), is entered through the most beautiful of all the Cambridge gateway towers. The first court, built in 1510–14, contains the new chapel, constructed by Sir G. G. Scott (1864–9), and the hall (lengthened in 1865), which has good original panel-work and a valuable collection of college portraits. The second court is a most beautiful piece of Elizabethan brickwork, built (1595–1620) by Ralph Simons. On the right is the gallery, now used as a combination room — the finest specimen of its class left in England — and through which the library is reached, an interesting example of Jacobean Gothic, built (1623–8) by John Williams, bishop of Lincoln. The third court was built in 1669–73. The gateway on the west and a covered bridge of one arch called the Bridge of Sighs lead to the fourth court, built by Rickman and Hutchinson (1826–30). The 'Backs,' so called — walks extending along the river to Queen's Grove — are thickly shaded with ancient trees. There are 56 fellowships and 60 scholarships.

Magdalene College (pron. *Maudlin*), was founded in 1542 by Thomas, Lord Audley, to replace Buckingham College, the site of which had been granted by Henry VI. (1428) to the English Benedictines. The entrance gateway (1585) opens into the single quadrangle containing the chapel (restored in 1850), the hall (built in 1519–21 by the third Duke of Buckingham), and the foundation library. Beyond the hall is the Pepysian library, a valuable example of 17th-century architecture, containing the manuscript of Pepys' famous *Diary*. A new range of buildings by Webb was finished in 1909. There are 7 fellowships.

Trinity College was founded in 1546 by Henry VIII., by the union of King's Hall (1337), Michaelhouse (1324), Fyswick's Hostel, and some minor hostels. The chapel, begun by Queen Mary and finished by Queen Elizabeth, contains statues of Newton, Bacon, Barrow, Macaulay, and Whewell, and the graves of Bentley and Porson. The fountain, queen's gate, and hall were built by Neville (1593–1604). Through the screens is Neville's or the Cloister Court, the western side of which is the library, designed by Sir Christopher Wren, and containing busts by Roubiliac, Thorwaldsen's statue of Byron, exquisite carvings by Gibbons, manuscripts of several of Milton's poems, a large collection of coins, and many rare books and manuscripts. Besides this court there are New Court, Bishop's Hostel, the Great Court, and Whewell's Courts. There are 63 fellowships and 80 scholarships.

Emmanuel College, founded in 1584 by Sir Walter Mildmay, occupies the site and buildings of the house of the Dominican friars. It is composed of two quadrangles. The chapel and cloister (1666–77), with the master's gallery above, were designed by Sir Christopher Wren. The 'brick building' dates from 1633, and 'the hostel' from 1885–94. There are 16 fellowships and 36 scholarships.

Sidney-Sussex College was founded in 1588 by a bequest of the Lady Frances Sidney Sussex, on the site of the house of the Franciscan friars, and incorporated by charter of Queen Elizabeth in 1594. It has three courts of three sides each. The present chapel is all that remains of the old Franciscan buildings. The hall contains the best extant portrait of Oliver Cromwell, who entered at Sidney-Sussex College. There are 11 fellowships and 36 scholarships.

Downing College, founded by the will of Sir George Downing (1717), did not receive its charter till 1800, owing to the litigation following the death of the founder (1749). The buildings, forming an irregular quadrangle, were designed by Wilkins in 1807. There are 6 fellowships and 6 scholarships.

Mention should be made of Selwyn College (1882), a public hostel for members of the Church of England, and Fitzwilliam Hall, the headquarters of the non-collegiate students. Ridley Hall (1879–82), the Clergy Training School, St. Edmund's House (for candidates for the Roman priesthood), Westminster College (1899, for Presbyterian students of theology), and the two colleges for women, at Girton (1869) and Newnham (1875), have no formal connection with the university.

The Fitzwilliam Museum, a sumptuous building, contains a large collection of paintings, illuminated manuscripts, engravings, vases, coins, and gems. The new museums of science, with lecture rooms, laboratories, and workshops, cover a very large area and are centrally located on and near the site of the old botanical garden.

Consult C. Dickens's *Dictionary of the University of Cambridge; The Architectural History of the University of Cambridge*, by Willis and Clark; J. Bass Mullinger's *History of the University of Cambridge;* Atkinson's *Cambridge Described and Illustrated;* Humphry's *Cambridge: The Town, University and Colleges; Student's Handbook to the University and Colleges of Cambridge* (1919).

Cambridge, city, Maryland, the county seat of Dorchester county, is situated on the Choptank River, on the Pennsylvania Railroad, and on steamboat lines to Baltimore; 57 miles southeast of Baltimore. It is in a fertile agricultural region and has a good trade in farm produce, fruit, livestock, fish, and crabs. It manufactures underwear and lumber and has flour mills and oyster and tomato canneries. Pop. (1910) 6,407; (1920) 7,467.

Cambridge, city, Massachusetts, one of the county seats of Middlesex county, is situated on the Charles River, which separates it from Boston, and on the Boston and Maine and Boston and Albany Railroads. Electric lines join it with a large number of surrounding towns, and several bridges across the Charles River connect it with Boston. The city covers an area 4½ miles long by 1 to 2 miles wide. Harvard Square at the southwestern corner of Harvard University grounds is a converging point for all the interurban railways and chief thoroughfares. Cambridge has many beautiful residences and broad streets shaded by magnificent old trees. It is the seat of Harvard University (q. v.) with its many beautiful buildings, of the Episcopal Theological School, Radcliffe College, Massachusetts Institute of Technology, removed there from Boston in 1916, and Andover Theological Seminary. Other important buildings are the Public Library, First Parish Church (Unitarian), Shepard Congregational Church, Christ Church (Episcopal), Cambridge Hospital, Home for Aged People, the Y. M. C. A., Y. W. C. A., Margaret Fuller House, the Craigie house, which was Washington's headquarters and later occupied by Longfellow, and Elmwood, the home of James Russell Lowell. The Washington Elm, under which Washington took command of the Continental army in 1775, still stands near the common. There is a fine park system including the Charles River Embankment and Fresh Pond. The Botanical Gardens, covering an extensive area and filled with a great variety of native trees and shrubs, and Harvard Observatory are about a mile from the city. Mount Auburn, west of the city, is the burial place of many famous New England men and women.

Cambridge, although primarily a city of homes and an educational centre, nevertheless has a thriving and ever expanding industrial section. Three important printing establishments, the Riverside Press, the University Press, and the Athenæum, are located here. There are also foundries and machine shops, meat-packing plants, as well as factories for making confectionery, musical instruments, structural iron work, pianos, organs, boots and shoes, rubber goods, automobiles, furniture, and soap. The Census of Manufactures for 1919 gives the number of establishments as 339, with an invested capital of over $98,742,000, and a value of manufactured products of over $186,603,000.

The site of Cambridge was at first selected (1630) for the headquarters of the Massachusetts Bay Colony, but it was found to be less advantageous for commerce and defence than the peninsula of Boston. It was permanently settled under the name of Newtowne in 1631, and in 1638 the present name was adopted. Stephen Daye, the first printer in the country, here issued his *Almanack for New England* in 1639. The American army during the siege of Boston was quartered in the town, as were also, later, the prisoners taken at Burgoyne's surrender. In 1846 Cambridge was incorporated as a city. In the Civil War the first volunteer company was organized here. The city comprises Old Cambridge, North Cambridge, East Cambridge, Cambridgeport, and a part of Mt. Auburn. Pop. (1910) 104,839; (1920) 109,694. Consult Eliot's *History of Cambridge, Massachusetts* (1913).

Cambridge, city, Ohio, county seat of Guernsey county, on the Baltimore and Ohio and the Pennsylvania Railroads; 76 miles east of Columbus. It is situated in a coal and iron region, and natural gas occurs in the vicinity. It has a public library, children's home, and a courthouse. The leading industrial establishments are glass-works, rolling mills, and manufactures of pottery and foundry products. Pop. (1910) 11,327; (1920) 13,104.

Cambridge, George William Frederic Charles, Second Duke of (1819–1904), son of Adolphus Frederick (1774–1850), first Duke of Cambridge, and second cousin of Queen Victoria, was born in Hanover. He led a division of Guards and Highlanders at the battle of the Alma (Sept. 20, 1854), and saw service also at Inkerman, Balaklava, and Sevastopol. He became general commanding-in-chief in 1856, and was made field-marshal at the majority of the Prince of Wales (Nov. 9, 1862). In 1887 he became commander-in-chief, which rank he held until his retirement in 1895.

Cambridge Platonists, the name given to a number of distinguished philosophers of the English church in the seventeenth century, sometimes known to their contemporaries as 'Latitude Men.' They drew their inspiration mainly from the study of the Platonic philosophy and sought to reconcile reason and religion. Among their number were Ralph Cudworth and Henry More (qq. v.) See also Latitudinarians.

Cambridgeshire, an inland county of England, lying north of Hertfordshire and Essex, south of Lincolnshire, east of Huntingdonshire, and west of Suffolk and Norfolk. It is oblong in shape, about 50 miles long and 30 miles wide, and contains approximately 860 square miles. The northern part is level throughout, while the southern part attains a height of 300 feet near Cambridge and of 100 feet toward the southeast. The chief rivers are the Great Ouse, the Cam, the Lark, and the Nene. The soil is fertile, and agriculture is the most important industry, small fruits, especially strawberries, being largely cultivated. Basket making gives employment to a large number of persons, while brick making, paper making, leather work, printing, and cement making are also carried on. Pop. (1911) 198,074; (1921) 129,594.

Cambuslang, kam'bus-lang, parish and town in Northwestern Lanarkshire, Scotland, on the Clyde River; a residential suburb of Glasgow. It has extensive steel works, and brick making and turkey-red dyeing are important industries. Population of the parish (1921), 26,130.

Cambusnethan, kam-bus-nē'than, parish and village, Mid-Lanarkshire, Scotland; 1¼ miles southwest of Wishaw, with which it is incorporated. It has coal mines and iron works. Pop. (1921) 32,730.

Cambyses, kam-bī'sēz (?–522 B. C.), king of the Medes and Persians, was the son of Cyrus the Great. He succeeded his father on the Persian throne, reigning from 529 to 521 B. C. His great achievement was the conquest of Egypt in 525, during which he treated the Egyptians and their religion with great severity, slaying the bull Apis, their god, with his own hands. Following this he made an unsuccessful attempt to conquer Ethiopia. He was a cruel and tyrannical ruler, instigating the murder of his own brother as well as bringing death to many other leading men. A revolt led by Gaumata, a Magian priest impersonating Cambyses' murdered brother Smerdis, recalled him from an expedition against Carthage, but he perished, either by accident or by suicide, at Ectabana on the return. His excesses are sometimes attributed to insanity.

Cam'den, city, Arkansas, county seat of Ouachita county, on the Ouachita River, a terminus for steamers from New Orleans, and on the Missouri Pacific, the Chicago, Rock Island, and Pacific, and the St. Louis and Southwestern Railroads; 90 miles southwest of Little Rock. It is a trade centre for live-stock and agricultural products and manufactures cotton, cotton-seed oil, wagons, and lumber. Pop. (1910) 3,995; (1920) 3,238.

Camden, village, Knox county, Maine, on Penobscot Bay; 8 miles north of Rockland and 15 miles south of Belfast. Electric roads connect it with Rockland and Thomaston, and various steamship lines with Boston, Bangor, and Castine. It is well known as a summer resort. Its industries include the manufacture of paper makers' felts, medicinal plasters, engines and boats, shirts, and ship machinery; there are also ship building plants, woollen mills, foundry and machine shops, and lime quarries. Camden was founded in 1769 by James Richards and was incorporated in 1791. It was named for Lord Camden, Lord High Chancellor of England. Pop. (1910) 3,015; (1920) 3,403.

Camden, city, New Jersey, county seat of Camden county, is situated on the left bank of the Delaware River and on the Atlantic City, the West Jersey and Sea Shore, and the Pennsylvania Railroads; opposite Philadelphia, with which it is connected by several ferries. The city has an excellent water supply, well-paved streets, and a municipally owned asphalt plant which turns out the material for street rebuilding. Among the important buildings are the Courthouse, City Hall, Elk's Club, Moose Club, Red Men Hall, Masonic Temple, Carnegie Library, Cooper Library, West Jersey Homeopathic Hospital, Cooper Hospital, Municipal Hospital, Chamber of Commerce Building, Y. M. C. A., Y. W. C. A., Y. M. H. A., and Y. W. H. A. Buildings, Knights of Columbus Building, Catholic Lyceum, Camden Club, Bellevue Private Hospital, Republican and Democratic Clubs, Camden Home for Friendless Children, Salvation Army, Society for Prevention of Cruelty to Children, and the New Jersey Conference Deaconess' Home.

The industries are widely diversified and include ship-building, making of canned soup, brick works, foundries, machine shops, woollen mills, chemical works, candy factories, talking-machine works, cigar factories, boot and shoe factories, paint and varnish works, licorice works, and leather factories. According to the Census of Manufactures for 1919, establishments number 336, with an invested capital of $256,492,000, and a product value of $323,226,000.

In 1773 Jacob Cooper, a merchant of Philadelphia, laid out a town plot of forty acres, calling it Camden in honor of Charles Pratt, the first Earl of Camden. In 1828 it was incorporated as a city and in 1850 a new charter was obtained, which was revised in 1871, at the addition of new territory. Pop. (1910) 94,538; (1920) 116,309. Consult Cooper's *Historical Sketch of Camden.*

Camden, town, Oneida county, New York, on the Rome, Watertown and Ogdensburg, and the Lehigh Valley Railroads; 30 miles northwest of Utica. It has abundant water power and manufactures of furniture, knit goods, sleighs, wagons, paper, and packing boxes. Dairying is carried on; corn-canning is an important industry; and maple sugar and syrup of good quality are produced. Pop. (1910) 3,426; (1920) 3,054.

Camden, city, South Carolina, county seat of Kershaw county, is situated on the Wateree River, and on the Seaboard Air Line, the Southern, and the Atlantic Coast Line Railroads; 28 miles northeast of Columbia. It has a fine bracing climate and is a popular winter resort. Its industries include brick yards, lumber works, and cotton and yarn mills. The town was founded in 1758 by Joseph Kershaw, an Irish Quaker. On August 16, 1780, General Gates was defeated here by the British General Cornwallis at the battle of Camden (q. v.). Pop. (1910) 3,569; (1920) 3,930.

Camden, BATTLE OF, a battle fought at Sanders Creek, near Camden, S. C., on Aug. 16, 1780, between a British force of about 2,200 under Lord Cornwallis and a superior American force, consisting mostly of untried militia, under Gen. Horatio Gates, who was decisively defeated. Early in the engagement a large part of the American militia fled precipitately, most of the fighting on the American side being done by the regulars under Baron de Kalb, who was mortally wounded. The conduct of General Gates was investigated by a court of inquiry, and in December he was superseded by General Greene. The English casualties numbered about 325, while the Americans lost, in killed, wounded, and captured, about 2,000 men. The battle of Hobkirk's Hill, in which General Greene was defeated by the British, April 25, 1781, is often spoken of as the second battle of Camden. Consult Carrington's *Battles of the American Revolution.*

Camden, CHARLES PRATT, FIRST EARL OF (1714–94) lord chancellor of England, was born in London. Admitted to the bar in 1738, he gained recognition for his successful defence of a bookseller charged with libel on the House of Commons. He became attorney-general in 1757, and in 1761 was appointed chief-justice of common pleas, in which capacity he championed John Wilkes (q. v.) by pronouncing illegal the issue of general warrants by the government. He was created baron (1765), and as lord chancellor (1766) he continuously opposed the government in its American policy and its treatment of Wilkes. His judicial career ended in 1770. On account of his liberal policy during the American Revolution his name became very popular in the United States, where it is borne by various counties, towns, and villages. President of Council in the second Rockingham administration, he ably defended the policy of Pitt. He was created earl in 1786.

Camden, WILLIAM (1551–1623), English antiquary and historian, was born in London. He became prebendary of Salisbury Cathedral (1589–1623), headmaster of Westminster (1593), Clarencieux king-at-arms (1597–1623), and was commissioned by James I. to translate into Latin the account of the trial of the Gunpowder Plot conspirators. He founded his professorship of history at Oxford in 1622. His most celebrated work, *Britannia,* a survey of the British Isles, first appeared in 1586, and was translated from Latin into English by Philemon Holland in 1610. Some of the theories advanced in the work are no longer tenable, but it is still of much value to scholars. Other works are a compilation of a list of the epitaphs in Westminster Abbey (1600), a collection of old English historians (1603), the *Remains concerning Britain* (1605), and the *Annales* of Queen Elizabeth's reign, the first part of which appeared in 1615. Consult *Life* by T. Smith and Wood's *Athenæ Oxonienses.*

Camden Town, a district in the northeast of London built in 1796 by Lord Chancellor Camden. It is in the vicinity of Hampstead. See LONDON.

Camel, a large ruminant of the genus *Camelus,* and constituting, with the llama (q. v.) of South America, the family *Camelidæ.* The camel has for centuries been subservient to man and is unknown in a wild state, although in some localities half-wild herds roam about—the offspring of animals which undoubtedly escaped from captivity. There are two distinct species of camel, the *Camelus dromedarius,* commonly known as the dromedary, and the *Camelus bactrianus,* or Bactrian camel.

C. dromedarius, the dromedary or true Arabian camel, is characterized by a single hump, which forms a regular pyramid and constitutes about one-fourth of the length of the body. The dromedary occurs in both Africa and Asia and has been successfully introduced into Australia, where it has proved valuable in exploration. Attempts to introduce it into the United States, in 1856, were unsuccessful.

C. bactrianus, peculiar to Central Asia, differs from the Arabian species in having two humps; it is also a shorter and stockier animal with longer and more abundant hair, and is better fitted for the rigorous climate of the Tibetan Plateau.

Animals of both species are large and ungainly, with long necks and fatty humps on the back and long, shaggy hair, reddish-brown in color, covering some parts of the body only. The feet are broad, two-toed, and provided with callous pads, similar to those which protect the chest and joints and upon which the animals rest in a kneeling position. The upper lip is hairy and deeply cleft; and the stomach is composed of three compartments, two of which are provided with a number of cells containing only fluid and which can be closed by muscular action.

The food of the camel is purely vegetable, consisting of grass, and the branches and leaves of trees. The animals crave salt and drink the most brackish water with relish. Because of the fat reserve in the hump and the peculiar formation of the stomach, camels can exist for long periods with little food and water, and are, therefore, especially valuable in desert transportation. They are also valued for their milk and flesh; the hair is woven into ropes and fabrics; and the bones, which are remarkably solid, are often used to replace ivory.

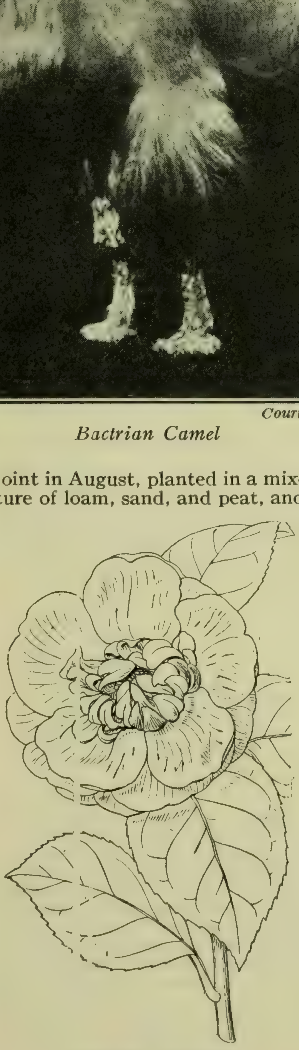
Camels are in general stolid, stupid beasts; they are obstinate and impatient, and exhibit no fondness for their masters. Both species are of a particularly vicious temperament, the kick or bite of an enraged camel being especially feared. Many breeds have been produced, especially in Arabia; the strong, slow varieties are used in farmwork and for carrying heavy loads, while the slender animals, which are swift and of easy gait, are employed for riding. Camel corps of European troops have been constantly organized when operating in Egypt and the Sudan since about 1880. The Egyptian camel corps is a permanent branch of the Egyptian army. The men are chiefly Sudanese, Arabs, and fellahin. Consult Leonard's *The Camel;* Count Gleichen's *With the Camel Corps up the Nile;* and for the 'wild' camel, Sven Hedin's *Through Asia* and *Central Asia and Tibet.*

Courtesy of American Museum of Natural History

Bactrian Camel

Camel, an apparatus used for raising a ship over shoal water. It consists of large hollow vessels which are attached to the sides of the vessel when full. When the ship reaches the shoal the vessels are pumped dry and the resulting buoyancy raises the ship enough to decrease its draft.

Camellia, k*a*-mel'i-*a*, a genus of Asiatic evergreen trees and shrubs belonging to the order Ternstrœmiaceæ and closely allied to the Tea family (see Tea). The best known species of camellia are the common *C. japonica* (the parent of most of our garden forms), *C. reticulata* and *C. Sasanqua.* The first named grows to a height of 30 feet, and bears reddish flowers about 4 inches in diameter. The others have pink and white flowers. All are greenhouse plants, especially suited to cool houses or winter gardens, where moisture is abundant. The attractive flowers are rather stiff and waxen. Propagation is usually by cuttings or layers, in the former case the ripe young shoots being cut off at a joint in August, planted in a mixture of loam, sand, and peat, and kept in a cool house during winter. In spring they should be placed in a warmer house, and in the following autumn moved into pots.



Camellia japonica

Camelopardalis, kam-el-ō-pär'd*a*-lis, a northern constellation added by Jakob Bartsch, Kepler's son-in-law and assistant, in 1624. It occupies the interval between Ursa Major and Cassiopeia, but includes no conspicuous stars.

Camelot, kam'*e*-lot, in Arthurian romance the seat of King Arthur and the knights of the Round Table. It has been identified by Geoffrey of Monmouth with Caerleon, Monmouthshire, and by others with Winchester of Queen's Camel, Somersetshire, and Camelford, Cornwall. Shakespeare alludes to it in *King Lear*, and Tennyson in *The Lady of Shalott* and the *Idylls of the King.*

Camel's Hair, the long hair of the camel, which is shorn every summer, is woven by the Arabs into clothing, tent-covers, and ropes. It is chiefly used in America and Europe for making the brushes used by painters, for dress materials and rugs. The linen haik of the Arabs is usually attached to the cap by a rope of camel's hair.

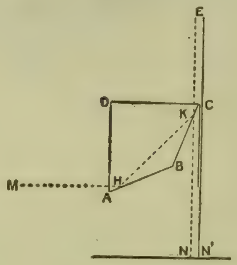
Camel's Thorn (*Alhagi camelorum*), a spiny shrub, native of West Asia, bearing papilionaceous flowers in summer, followed by legumes in August.

Camenæ, ka-mē'nē, in Roman mythology, prophetic nymphs, worshipped in the old Italian religion, and often identified with the Greek muses. A temple at the foot of the Capitoline Hill in Rome was erected for their use.

Cameo, a gem cut or engraved in relief. The art of cameo-cutting consists in carving out a figure in the upper of two differently colored layers of stone so that it stands out in relief on a darker ground. The phrase has been loosely applied to all sorts of lapidary work. The materials used are: (1) translucent rock crystals—*e.g.* amethyst (purple), emerald smaragdus (vivid green), carbuncle, anthrax (rose), jacinth (orange-red), chrysolite (golden), beryl (sea-green); (2) semi-translucent crystals—as various agates, the onyx, chalcedony, or cloudy quartz and its varieties, such as the orange-red sardius, and, *par excellence*, the sardonyx; (3) opaque crystals—various jaspers, lapislazuli (sapphire), turquoise, and chrysoprase; (4) certain metallic oxides and bituminous substances—*e.g.* hæmatite, malachite, and amber; (5) animal secretions—as coral and the inner layers of certain molluscan shells; lastly, and largely for purposes of imitation of the antique cameos, vitreous pastes. The cutting and polishing of agates is an important industry at Oberstein in Oldenburg and it is said that the Egyptian scarabæus is doubtless the origin of the cameo. The art was largely practised by many of the older races before the classical period, and reached its climax *c.* A.D. 150. Genuine antique cameos signed by the artist are extremely rare. The British Museum and the museums at Florence and Naples have a few so signed; and the authentic signature of Dioscorides may be seen on a few intaglios, among which is the portrait of Cicero. Names of possessors were, in the antique and early Christian epochs, graven on the gem itself; later, on the metal mounting only. Consult A. H. Smith's *Catalogue of Engraved Gems in the British Museum;* and C. W. King's *Antique Gems and Rings.*

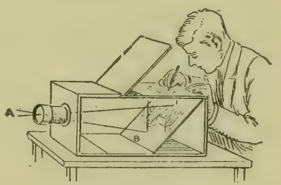
Camera. See CINEMATOGRAPH; PHOTOGRAPHY.

Camera Lucida, kam'e-*ra* lū'si-*da*, the name given to two different instruments: (1) that of Dr. Hooke, for the purpose of casting the image of any object on the wall of a lighted room; (2) an ingenious contrivance of Dr. Wollaston for making outline sketches of any distant object. The best form is essentially a prism (vertical cross-section ABCD) such that AB makes 22½° with the horizon, and BC makes the same angle with the vertical. A horizontal ray from the object M is twice totally reflected (see REFLECTION and REFRACTION) at H and K so as to emerge vertically from K to E. The eye at E refers the ray HK along the line EKN, and therefore the image of M is seen at N. But the eye at E sees also past the corner of the prism C, along the line EN', and thus on a paper placed at NN' the operator can trace the image of the object at M. The amateur microscopist can achieve equally satisfactory results by fixing a small plate of transparent and polished glass to the eye piece of his microscope, so that it will make an angle of 45° with the axis of the tube, using for this purpose a small ball of adhesive wax.



Camera Lucida

Camera Obscura, ob-skū'*ra* (Lat. 'dark chamber'), so called by Battista della Porta in 1558, because the form described was really a dark room lighted only by a hole in the window shutter allowing the rays from without to pass through a convex lens. At the focal distance a sheet of white paper, especially if curved to suit the focal distance, will very faithfully show the figures of the objects opposite the lens, with their proper colors and motions. A convenient form is obtained by placing the convex lens at the top of a dark tent of movable box, and letting the rays fall vertically upon it by means of a plane mirror above it inclined at 45°. The height of this camera, or the distance of the table from the lens, should equal the focal length. Battista della Porta does not appear to have been the inventor of the camera obscura, since it is referred to by Leonardo da Vinci and even in the 13th century it was known to Friar Bacon.



Camera Obscura

Tracing on ground glass the view reflected from mirror B; A, convex lens.

Camerarius, kä-mä-rä'rē-o͝os, JOACHIM (1500–74), German humanist and classical scholar, was born in Bamberg, and in deference to the family's hereditary office of episcopal *Kämmerer* (chamberlain) he changed his proper name of Liebhard into Camerarius. He was educated at the University of Leipsic and for a time taught Greek and Latin in Nuremberg. He took a conspicuous part in the Diet of Augsburg (1535), established the study of the classics at Tübingen University (1535) and effected important reforms at Leipzig University (1541). His works include a biography of Melanchthon (1566), excellent editions and translations of Greek and Latin writers, and contributions to Greek and Latin grammar and antiquities. He was a friend of Erasmus and Melanchthon. His son JOACHIM (1534–98) was a distinguished physician and botanist.

Camerarius, RUDOLF JAKOB (1665–1721), German physician and botanist, laid the foundation of the sexual theory of plants in his *Epistola de sexu Plantarum* (1694).

Camerino, kä-mā-rē'nō, city, Italy, in the province of Macerata, on a spur of the Apennines; 69 miles southwest of Ancona. It is the seat of a 'free' university, founded in 1727, and the chief industry is silkworm rearing. Pop. 12,000.

Camerlengo, kam-*er*-len'gō (It. 'chamberlain'), the cardinal in charge of the financial and judicial interests of the Holy See. During an interregnum he presides over the apostolic chamber, and administers the functions of government till the election of a new pontiff. The cardinals also have a camerlengo who administers the revenue of the Sacred College.

Cameron, city, Missouri, in Clinton County, on the Chicago, Rock Island, and Pacific, and the Chicago, Burlington, and Quincy Railroads; 33 miles east of St. Joseph. It has agricultural interests and manufactures wagons. Pop. (1910) 2,980; (1920) 3,248.

Cam'eron, city, Texas, county seat of Milam County, on the Gulf, Colorado, and Santa Fé and the Southern Pacific Railroads; 64 miles northeast of Austin. It is a shipping point for agricultural produce and has manufactures of ice and cotton. Pop. (1910) 3,263; (1920) 4,298.

Cameron, Sir Charles Alexander (1830), agricultural chemist, was professor of hygiene at the Royal College of Surgeons, Ireland (1867), of which he was president in 1885. He was appointed public analyst for Dublin in 1862. Besides a history of his college, he has published *Chemistry of Agriculture* (1857), *Lectures on Public Health* (1868), *Manual of Hygiene* (1874), *Elementary Chemistry and Geology* (1896, 1898), etc.

Cameron, Sir Duncan Alexander (1808–88), British general, joined the Black Watch (1825), fought in the Crimean War at the Alma (1854), at Balaklava, and at Sebastopol (1855); and became commander of the forces in New Zealand, where he defeated the Maoris (1863). He became general (1874).

Cameron, James Donald (1833), American politician, the son of Simon Cameron, born at Middletown, Pa. He graduated at Princeton in 1852, engaged successfully in business, was president of a bank at Middletown, and from 1866 to 1874 was president of the Northern Central Railroad Company. In many respects he was the political heir of his father and was long influential as a Republican, both in state and in national politics. He was Secretary of War in the Cabinet of Pres. Grant (1876–7), was a member of the U. S. Senate (1877–97) as the successor of his father who resigned to make a place for him, and in 1880 was chairman of the Republican National Committee. He is generally known as "Don" Cameron.

Cameron, John (?1579–1625) Scottish scholar and theologian, born in Glasgow. In 1622 he became principal of Glasgow University; but the odium excited by his advocacy of the divine right of kings compelled his resignation (1623), and ultimately he became professor of divinity in the University of Montauban (1624). His death, next year, was due to an assault made on him by opponents of his doctrine of passive obedience. He was the author of *Santangelus* (1616), *Theses de Gratia et Libero Arbitro* (1618), *Theses XLII. Theol. de Necessitate Satisfactionis Christi pro Peccatis* (1620), etc. See *Memoir* by Cappel (1642).

Cameron, Richard (*c.* 1648–80), Covenanting leader, was born at Falkland in Fife. Converted from Episcopacy by the field preachers, he became an ultra-Presbyterian. After two years' residence in Holland he returned in 1680, and took part in the Sanquhar Declaration, for which a price of 5,000 marks was set on his head. He continued to preach whenever opportunity offered, until his party was surprised by a body of dragoons at Aird's Moss in Ayrshire, and Cameron and his brother were among the slain. See Howie's *Scots Worthies* (1876); *Richard Cameron*, by Professor Herkless, 'Famous Scots Series' (1896).

Cameron, Simon (1799–1889), American political leader, born at Maytown (now Donegal), Pa. He received little education, served an apprenticeship to a newspaper publisher at Northumberland, Pa., and as editor in turn of the Doylestown (Pa.) *Democrat* and the Harrisburg *Intelligencer* he first showed his remarkable aptitude for politics, eventually gaining almost complete ascendency over the Democratic Party in Pa., and becoming a power, also, in national politics. He was also notably successful in business and accumulated a large fortune. From 1845 to 1849 he was a Democratic member of the U. S. Senate. Subsequently, however, he became one of the foremost leaders of the 'People's Party' in Pa., which soon developed into the Republican Party, and, as a Republican, he was again a member of the U. S. Senate (1857–61). When war threatened between the North and South he joined Seward in favoring a policy of conciliation. In 1860 he was a prominent candidate for the Republican presidential nomination, and in 1861, though he was strenuously opposed by many prominent Republicans, especially by Gov. Curtin and A. K. McClure of Pennsylvania, he was appointed Secretary of War in Pres. Lincoln's Cabinet. His administration of the War Department caused general dissatisfaction. Though the charges of peculation brought against him personally are now thought to have been unjust, it is certain that he awarded contracts to his political followers and friends, some of whom grossly defrauded the government, and in Jan., 1862, he was removed by Pres. Lincoln, who, however, commended him for 'ability, patriotism, and fidelity to public trust.' Soon afterward he was formally censured (April 30) by the House of Representatives. He was U. S. minister to Russia in 1862, and was once more a member of the U. S. Senate (1867–77), resigning to create a vacancy for his son, J. D. Cameron (q.v.). Cameron was undoubtedly one of the shrewdest, most adroit, and most astute of politicians in the history of the U. S.

Cameron, Verney Lovett (1844–94), African traveller, born at Weymouth, Dorsetshire. He took part in the Abyssinian campaign, and in suppressing the slave trade in E. Africa. At the head of an expedition to carry aid to Livingstone, Cameron left Zanzibar in 1873, but at Unyanyembe heard the news of Livingstone's death. He then determined the position of the southern portion of Lake Tanganyika. Having defined Nyangwe to be on the main stream of the Congo, he struck south, and then west, and discovered the sources of the Zambezi. He was (1875) the first traveller to cross the breadth of Africa. In 1878 he explored the route for a railway from Beirut to Bushire, and in 1882 the Gold Coast. He was killed when hunting at Leighton-Buzzard, in Bedfordshire. His works include *Across Africa* (1877, 2nd ed. 1885), and *Our Future Highway to India* (1880).

Cameronians, a sect of Scottish Presbyterians, originating in the latter part of the 17th century, deriving their name from their chief leader, Richard Cameron (d. 1680), who, with his colleagues, John Semple, Alexander Peden, and John Welwood, definitely separated themselves from the great body of Presbyterians in Scotland, on the question of the spiritual independence of the church. They repudiated the authority of Charles II., took up arms against him, and were defeated in battle at Aird's Moss, July, 1680. Cameron was slain. The defeat and the relentless persecution by the Scottish government which followed, had only the effect of intensifying their zeal and of increasing their numbers; and they continued to hold their conventicles among the moors (whence their name of 'hill-folk' or 'hill-men'). With high spiritual feeling they combined the fiercest fanaticism, and many of them were so ignorant as to ascribe supernatural and prophetic power to Peden, Cameron, and Semple. Their fierce polemical and controversial spirit is seen from the fact that, on one point or another, they were soon subdivided into petty sects, such as the Hamiltonians, the Harleyites, the Howdenites, the MacMillanites, and the Russelites: the founder of this last sect was James Russel, one of Archbishop Sharp's assassins.

The Cameronians are still represented by a few congregations bearing that name. They prefer themselves to be called 'Reformed Presbyterians,' and as such have a few representatives in the United States. See Presbyterians and Shield's *Faithful Contendings Displayed* (1780); *Testimony of the Reformed Presbyterian Church* (1842); and Walker's Lives of Peden, Semple, Welwood, Cameron, Cargill, and Smith, republished (1901) as *Six Saints of the Covenant*, and edited by Hay Fleming.

Cameroon. See Kamerun.

Camiguin, isl., Misamis prov.,

Philippine Islands, lying 6½ m. N. of Sipaca Pt., Mindanao. Area, 113 sq. m. It is of volcanic origin and still shows activity, is mountainous, the highest peak being 5,383 ft., and has several towns and a port at Catarman. The crops are tobacco, cacao, and rice, and wax is an important product. In comparison with its relatively small size Camiguin is one of the best agricultural areas of the islands. Pop. (1903) all civilized, 30,754.

Camiling, SAN MIGUEL DE, pueb., Tarlac prov., Luzon, Philippine Is., 25 m. S.S.E. of Lingayen, on river of same name. It produces timber, rice, maize, cotton, and sugar-cane. Pop. (1903) 25,243.

Camillus, MARCUS FURIUS, one of the early heroes of Rome, perhaps the first who is a character of history rather than of legend. He was censor in 403 B.C., military tribune with consular powers six times, and dictator five times. In 396 he defeated the people of Falerii and Fidenæ, and captured Veii. In 391 he was banished on the ground of having unfairly distributed the booty of Veii. He rebuilt Rome, and so was called a second Romulus. In later campaigns he won victories over the Volscians and Etruscans, and finally, in 367 B.C., when eighty years of age, routed an invading band of Gauls. Camillus was a patrician, and a rigid upholder of the rights of his order against the commons.

Camisards, the Protestants of the Cévennes who rose in arms after the revocation of the Edict of Nantes (1685). They obtained their name from the white shirt (*camise*) which they adopted as a uniform. The ruthless cruelties of the ministers and troops (*dragonnades*) of Louis XIV. produced at first many converts to Roman Catholicism, while others fled from their native land; but a stern and fanatical minority, consisting for the most part of those who were too poor to escape, held out in the mountains, and at last (1702) slew the Abbé du Chayla, for fifteen years their merciless persecutor. Then, under the daring leadership of Roland and Jean Cavalier, the latter a youth of eighteen, the rising took shape. Prophets arose and the usual abnormal phenomena of religious excitement among an ignorant people appeared. A series of successes led to the appearance of Montrevel, a marshal of France, at the head of 60,000 men and it became necessary to split the Camisard force, which never exceeded 3,000, into roving bands. During 1703 the royal army devastated the country, destroying over four hundred villages, while the Camisards on their part burned churches, murdered priests, and plundered generally. In the following spring the Camisards gained the battle of Cannes, but in April a body of 1,000 was only saved from annihilation by the military genius of Cavalier. The latter now found himself opposed by the famous Marshal Villars, who adopted conciliatory tactics; and a meeting between the two leaders resulted in the acceptance by Cavalier of certain concessions. Nothing less than the restoration of the edict, however, would satisfy the fanatics of the party; and Cavalier and some of the more moderate Camisards having left the country, hostilities were resumed, ending in the slaughter or expatriation of the remnant. Some of the wanderers found their way to Spain, where Cavalier had taken service with the British, and distinguished themselves at the battle of Almanza (1707). After this engagement, where so many of his co-religionists perished, Cavalier went to Britain, and was governor successively of Jersey and the Isle of Wight. See *Revolt of the Protestants of the Cevennes*, by Mrs. Bray (1870), T. Schott's *Kirche der Wüste* (1893), and H. M. Baird's *Huguenots and the Revocation of the Edict of Nantes* (1895).

Camlet, a rich fabric which during the middle ages was made from camel's hair, but now is generally made from the hair of the Angora goat, mixed with silk, wool, or cotton.

Camoens, or CAMOES, LUIZ DE (1524–80), the greatest of Portuguese poets, was born at Lisbon in 1524. When only sixteen he had already written his *Amphitriões*. At the age of eighteen he fell in love with a lady of the court, Donna Caterina de Ataide; but her father forbade their union. Camoens remained true to her till her death, at a late period in his own life. In his *Rimas* he passionately celebrated his love. Banished from Lisbon for a time, he joined as a volunteer the expedition which John III. sent out against the Moors of Ceuta, and distinguished himself in several engagements. In a naval encounter in the Strait of Gibraltar he lost the sight of his right eye. Having wounded one of the king's equerries, he was thrown into prison and was only released on the understanding that he would volunteer for service in India. He arrived at Goa in 1553. At this time he fought under the king of Cochin against the king of Pimenta and again took part in an expedition against the Arabian corsairs in the Red Sea. But his outspoken condemnation of certain Portuguese officials caused his banishment to Macao in 1556. A new viceroy having permitted him to return to Goa, which he reached in 1560, his troubles began again; for his enemies having accused him of malversation in office, he was cast into prison. After some years he obtained his liberation, and proceeded to the distant and barbarous settlement of Sofala. Finally, after an absence of nearly seventeen years, Cameons arrived at Lisbon, in abject poverty, in 1569. His celebrated work, *Os Lusiadas* (*i.e.* the Lusiads or Lusitanians, standing for the Portuguese), was published in 1572. The poem proved an immediate success; but its unhappy author died in the public hospital on June 10, 1580. In addition to his masterpiece, Camoens wrote a number of songs and eclogues, three dramas, and no fewer than 352 sonnets. An edition of his works appeared at Lisbon, in four volumes, in 1779–80, and a further edition, in five volumes, in 1782–3. The *Lusiads* have been translated into English by Sir R. Fanshawe (1655), Mickle (1771–5; new ed. 1877), Musgrave (1826), Quillinan, four books only (1853), Sir L. Mitchell (1854), Aubertin (1878), and Sir R. Burton (1881). A fine edition was published at Paris in 1817. A portion of the sonnets was translated by Aubertin in 1881, and a complete version of them by Sir R. Burton in 1885. See also *Life* of Camoens in German, by W. Storck (1890); *Poems* of Camoens, with remarks on his life and writings, by Lord Strangford (1805); and *Camoens, his Life and his Lusiads: a Commentary*, by Sir R. Burton (1882).

Camomile. The camomile, or chamomile (*Anthemis nobilis*), is much cultivated in Europe as a medicinal herb. It has prostrate stems and downy, doubly-pinnate leaves, and in July and August bears solitary daisy-like heads of flowers, with central convex yellow discs and white recurved rays. The flower-heads point downward before they expand. The whole of the plant has an aromatic fragrance, whence it derives its name of chamomile (*chamæmelon*). As *anthemis* the plant was known to the Greeks, and its dried flower-heads were early used in medicine, Dioscorides extolling its virtues in the treatment of intermittent fevers. The flowers should be picked in fine weather, as soon as they are fully open, and dried in the shade, care being taken to turn them frequently. An infusion of the flowers acts as a mild tonic, as a stomachic, and as a diaphoretic and diuretic. If given warm and in full doses, it acts as an emetic.

Camorra, a secret society in S. Italy, which took its rise during the times of Bourbon misgovernment in the former kingdom of Naples. While mainly composed of the poorer criminal classes, banded together to evade and defy the law, it also included many associates from the upper classes, who carried on their lawless schemes with its aid. Its energies were chiefly directed to extortion, often on a large scale, and to smuggling; but at the same time it carried on brigandage, and lent itself to more serious crimes. The members were bound together by a stern and exacting discipline, and as a rule faithfully observed the oath of secrecy under which they worked. The last Bourbon Minister of the Interior, Liborio Romano, was in league with the Camorra, and used it for his own ends. The rebellion of 1860 was carried through largely with the help of the Camorra.

After the union of the kingdom of the Two Sicilies (Naples) with Sardinia, the governor of Naples, Lamarmora, effectually curbed its worst excesses. But the organization still survived, though toward the end of the nineteenth century it assumed the aspect of a political party, and secured possession of the municipal government of Naples. Finally, its corrupt methods aroused the interference of the Italian government (1899–1901); and an Honest Government League was formed which defeated the Camorra candidates at the polls.

The Society retained considerable power, however. In June, 1906, a double murder, committed under circumstances of unusual cruelty by four delegated members of the Society, removed two of its agents who were suspected of ambition or treachery, and resulted in the arrest of forty men. The difficulty of getting evidence within the sphere of the Society's influence caused the removal of the court to Viterbo, where the trial was opened in March, 1911. One of the Camorrists, Abbatemaggio, turned state's evidence, and told a detailed story of the Camorrist methods and crimes. The other prisoners, including Enrico Albano, or Erricone, the reputed head of the Society, denied all knowledge of these crimes, and even of the Camorra's existence. About 650 witnesses on each side were called. After a trial lasting until July, 1912, 30 of the accused men were found guilty, of whom 8 were sentenced to prison for thirty years, and 18 received sentences varying from five to nine years.

Consult Monnier's *La Camorra;* Umiltà's *Camorra et Mafia;* Alongi's *La Camorra;* Serao's *The Head of the Camorra.*

Camouflage, cam-o͞o-fläzh' (literally, 'faking'), a term adopted from the French theatrical vocabulary (in which it signifies the process of 'making up') to describe the new military art of so concealing or disguising an object that the enemy cannot recognize it. The practice of camouflage is not entirely new, as is evidenced by the screening of trench furrows with leaves and sod in earlier wars. As a military art, however, it has received recognition only since the outbreak of the present world conflict, and the introduction of the aeroplane for observation purposes.

The simplest forms of camouflage are those which employ natural means of protection, as screens of leaves and boughs, or stacks of hay; but these are at best of limited application. To conceal long lines of supply trains, far-reaching trench systems, and vast encampments of men, and to meet the other requirements of modern warfare, artificial means must be resorted to. The earliest attempts consisted chiefly in the painting of guns, tractors, and ammunition wagons in realistic imitation of the foliage and rock forms by which they were to be surrounded. The results thus produced are only partially satisfactory, particularly as the painted objects must often be moved into surroundings of wholly different character; while at long distances the strokes of paint become blended, and reveal the outlines of the object itself.

To remedy these defects a plan has been adopted based on the protective coloration observed in birds and animals. High lights are darkened; under surfaces are lightened with colors in general harmony with the surroundings; outlines are broken by irregular streaks and blotches of color; wheels and other prominent projections draped with painted cloth; and the whole screened with reed or leaf nettings.

The concealment of roads, a later development, has become of vital importance for the transportation of supplies and troops. The usual method is by the use of road screens consisting of leaves on wire netting, of burlap, or of other material stretched along the road to form a continuous wall on either side, or arranged in a series of wings extending outward from the edges of the road. A network of cloth is strung overhead as a further protection.

Another phase of camouflage is the introduction into the landscape of objects intended merely to distract the enemy. 'Fake' trenches are dug in such a way that they appear to be part of the real trench system; dummy guns are interspersed with real ones; and sheds, barracks, and headquarters are simulated by clever scene painting in order to draw the fire of the enemy's guns.

Camouflage is also extensively used on ships at sea as a protection against the submarine (q. v.) The hulls of vessels are painted to blend with sky and ocean, rendering them practically invisible at a short distance, or in such a way as to give an erroneous impression of character, size, or speed.

The art of camouflage as practised in the present war originated with the French, and was speedily taken up by the other nations. In the United States an American Association for Camouflage was organized by a number of artists early in 1917, and a Camouflage Division was later organized as a branch of the Engineer Corps. For an excellent illustration of camouflage, see the article on TANK, MILITARY.

Camp, Military.—ROMAN.—The Roman camp of the Polybian period surrounded the *prætorium*, or consul's tent, the whole camp lying within an exact square whose sides measured 2,017 Roman feet. The main street was 100 feet wide. There were four entrances, one at or near the middle of each side. The *intervallum* between the tents and the ramparts was 200 feet wide. The rampart which enclosed the camp all round was made of earth thown up from the moat which lay outermost, and was surmounted by a palisade. About two-thirds of the camp afforded accommodation for two legions (9,000 men) and 9,600 allies. The camp at the time of Hyginus—about 250 years subsequently—was an oblong of about 2,400 by 1,440 feet, the intervallum was reduced to 60 feet, and there were other modifications.

MODERN CAMPS.—The camp used in active service in the field is composed either of tents or of huts, or it may be merely a bivouac where shelter from the weather is extemporized out of branches, straw, or any handy material. In the U. S. Army the tents used are pyramidal, common, and wall tents for ordinary camps. In addition to this, each man carries one-half of a shelter tent, which when set up affords excellent protection to two men. Huts are used only when an army is occupying a defensive position for a long time, during a siege, when resting in winter quarters in a hostile country, waiting for seasonable weather, etc.

During the temporary occupation of any territory by a large body of troops (as was the case with U. S. troops in parts of Cuba and the Philippine Islands), camps are established with more or less permanent buildings of wood or thatch for shelter of troops.

Camps are of various kinds, depending upon the length of occupancy, the military situation, the character of communication with the base, and the facilities afforded by the country. In time of peace and when not in the presence of the enemy, camp grounds which are to be occupied for some length of time are selected with great care; but in the presence of the enemy every consideration must give way to military necessity. The troops must find such shelter as the enemy will allow them, often being reduced to the necessity of lying out in the open without shelter of any kind.

It is a military axiom that to maintain the efficiency of any command the troops must have adequate shelter. A good camp ground should fulfill the following conditions:

1. The site should be convenient to an abundant supply of pure water.

2. Good roads should lead to the camp, and interior communication throughout the camp should be easy. A camp near a main road is undesirable on account of dust and noise. If the camp is a large one, good railway communications and ample siding facilities should be convenient.

3. Wood, grass, forage, and supplies should be at hand or easily obtainable.

4. The ground should accommodate the command without crowding and without compelling the troops of one unit to pass through the camp of another, either when going to drill or to reach the main road.

5. The site should be sufficiently high and rolling to drain off storm water readily, and, if the season be hot, to catch the breeze. In cold weather it should preferably have a southern exposure with woods to the north to break the cold winds. In warm weather, an eastern exposure, with the site moderately shaded by trees, is desirable.

6. The site should be dry. For this reason porous soil, covered with stout turf and underlaid by a sandy or gravelly subsoil is best. A site on clay soil, or where the ground water approaches the surface, is damp, cold, and unhealthful. Alluvial soils, marshy ground, and ground near the base of hills, or near thick woods or dense vegetation, are undesirable as camp sites on account of dampness. Ravines and depressions are likely to be unduly warm and to have insufficient or undesirable air currents.

7. Proximity to marshes or stagnant water is undesirable on account of the dampness, mosquitos, and the diseases which the latter transmit. The high banks of lakes or large streams often make desirable camp sites.

8. Dry beds of streams should be avoided, as they are subject to sudden freshet.

9. The occupation of old camp sites is dangerous, since these are often permeated by elements of disease which persist for considerable periods. Camp sites must be changed promptly when there is evidence of soil pollution or when epidemic disease threatens, but the need for frequent changes on this account may be a reflection on the sanitary administration of the camp. A change of camp site is often desirable in order to secure a change of surroundings and to abandon areas which have become dusty and cut up.

National Army Cantonments and National Guard Camps.

National Army		
Camp Devens	Ayer, Mass	76th Division
Camp Upton	Yaphank, Long Island	77th Division
Camp Dix	Wrightstown, N. J	78th Division
Camp Merritt	New Jersey	
Camp Meade	Annapolis Junction, Md	79th Division
Camp Lee	Petersburg, Va	80th Division
Camp Jackson	Columbus, S. C	81st Division
Camp Gordon	Chamblee, Ga	82nd Division
Camp Sherman	Chillicothe, Ohio	83d Division
Camp Taylor	Dumesnil, Ky	84th Division
Camp Custer	Battle Creek, Mich	85th Division
Camp Grant	New Milford, Ill	86th Division
Camp Pike	Little Rock, Ark	87th Division
Camp Dodge	Des Moines, Iowa	88th Division
Camp Funston	Ft. Riley, Kansas	89th Division
Camp Travis	San Antonio, Tex	90th Division
Camp Lewis	American Lake, Wash	91st Division
National Guard		
Camp Wadsworth	Spartanburg, N. C	27th Division
Camp Hancock	Augusta, Ga	28th Division
Camp McClellan	Anniston, Ala	29th Division
Camp Sevier	Greenville, S. C	30th Division
Camp Wheeler	Macon, Ga	31st Division
Camp McArthur	Waco, Texas	32nd Division
Camp Logan	Houston, Texas	33d Division
Camp Cody	Deming, N. M	34th Division
Camp Bowie	Ft. Worth, Texas	36th Division
Camp Sheridan	Montgomery, Ala	37th Division
Camp Shelby	Hattiesburg, Miss	38th Division
Camp Beauregard	Alexandria, La	39th Division
Camp Kearney	Linda Vista, Cal	40th Division
Camp Greene	Charlotte, N. C	41st Division
Camp Mills	Long Island, N. Y	42nd Division
Camp Doniphan	Ft. Sill, Okla	35th Division

It is very seldom that all of these conditions will be fulfilled, but as far as the military situation warrants, as many as possible should be met. For example, two hostile armies might be in contact either beside or even in the midst of a swamp but not all the force of either side would be withdrawn to a better or more healthful camp site. On the march in time of peace in the United States troops often have to accept such camp sites as are available. The best site in the vicinity of the place selected for a halt is taken, but the distance between suitable halting places frequently places many limitations on the choice of camp sites.

The form of a camp, especially of a one night camp for troops on the march, should be such as to facilitate prompt encampment of the troops and their prompt departure when camp is broken. The form also will depend upon the proximity of the enemy and the amount and character of ground available. When near the enemy, camps should of necessity be constructed to facilitate security at night and deployment for action.

When marches are made in time of peace arrangements for the halts and camps are made some time in advance. But this is not possible in time of war in a hostile country. If the column is large and not in close touch with the enemy, the commander of the troops sends one or more staff officers up with the advance guard to select sites near the place where a halt is ordered and to guide organizations to their sites. Places for obtaining cooking and drinking water, for watering animals, for bathing and washing clothes are designated. The troops sleep in their shelter tents and in such few wall or pyramidal tents as can be carried on wagons.

In a permanent or semi-permanent camp, more attention is given to shelter and sanitation and to the comfort of the troops. The troops are sheltered in pyramidal tents, and various conveniences are added, the number of such usually varying with the length of occupancy. If occupancy is to be for a considerable period tent floors, frame kitchens and mess halls, bathing and toilet facilities may be added, and even water and sewer systems may be installed. Finally in extreme cases the tents may be replaced by huts or barrack buildings constructed of lumber or other material which may be obtained locally. In the latter case the camp becomes a cantonment (See CANTONMENT.)

If a camp is to be occupied a long time, say a year or more, it is a measure of economy to construct buildings instead of putting the troops in tents, aside from the greater comfort afforded the troops. Tentage is expensive, and a tent does not last long, especially if subjected to high wind.

In the United States, manœuvre and training camps at ports of embarkation are usually intended for long or comparatively long occupancy, and every convenience is given the troops, even to the construction of cantonments. As examples of these we have the present training camps for the National Guard and National Army, the former tent camps and the latter cantonments; and the various State militia permanent camps. In addition to the conditions which other camps should fulfill, a training or manœuvre camp should be situated conveniently near ample ground suitable for training of troops or for manœuvring troops. The sites for these camps are usually selected by boards of officers; one or two members of the board are medical officers and especial attention is given to sanitary and health conditions.

In the United States both camps and cantonments are called camps to distinguish them from the permanent posts, which are called forts (q. v.) and are established by act of Congress. The camps and cantonments are established by War Department order, on government ground if available or on leased or requisitioned ground if government-owned land is not available. See CANTONMENT; SANITATION, MILITARY.

Camp, WALTER (1859), American writer, was born in New Haven, Conn. He was graduated from Yale in 1880; has since taken an active interest in the athletic undertakings of that university; and is a member of Yale University Council. He has written extensively on sporting subjects for periodicals; edited the Library for Young People; and has published: *Book of College Sports; Yale, Her Campus, Class-room, and Athletics; Book of Football; Auction Bridge up to Date; American Football.*

Campagna, Roman, cäm-pän′yä, (*Campagna di Roma*), the undulating, marshy plain, of volcanic formation, which stretches for 90 miles along the coast of the Tyrrhenian Sea from Civitavecchia south to Terracina, and for 40 miles on the east to the Alban and Sabine Hills. It is divided into vast estates leased to tenants or companies of capitalist farmers. Though the soil is fertile, a relatively small part is cultivated (chiefly cereals, wine, and fruits). Horses and buffaloes (used for draught purposes) are reared, in addition to cattle, sheep, and goats. The prevalence of malaria left the Campagna a desolate waste, almost the only inhabitants being the shepherds and farm laborers. In recent years, however, drainage, the regulation and embankment of the Tiber and other rivers, the reclamation of the riverine tracts, the screening of windows and doors, and the planting of eucalyptus trees have greatly diminished the extent and violence of the disease.

The prevalence of malaria on the Campagna in ancient Roman times is attested by frequent allusions in the works of Roman authors. An extensive system of sanitation, however, begun shortly before the establishment of the empire and maintained under imperial direction, encouraged the settlement of the region. The Campagna to-day is covered with the ruins of villages and of the fourteen aqueducts that brought spring water from the mountains. The plain was devastated by barbarian invaders—Goths, Vandals, and Longobards—and subsequently by Normans and Saracens. The civil broils of Rome in the late Middle Ages also contributed to its ruin. See AGRO ROMANO. Consult Ashby's *Roman Campagna;* Lanciani's *Wanderings in the Roman Campagna* (1909).

Campaign Expenses. See ELECTIONS.

Campaign, Military. See ARMY IN THE FIELD.

Campaign, Political. See ELECTIONS.

Campan, JEANNE LOUISE HENRIETTE (1752–1822), French educational writer, was born in Paris. At fifteen she was appointed reader to the daughters of Louis XV., and became the first lady of the bedchamber to Marie Antoinette. After the Reign of Terror she opened a school at St. Germain, where she taught Hortense, the mother of Napoleon III. In 1807 Napoleon I. appointed her superintendent of the imperial school at Ecouen, which was suppressed, however, by Louis XVIII. Her best known works are: *Mémoires de la Vie Privée de Marie Antoinette* (1823); *Journal Anecdotique* (1824); *Correspondance Inédite avec la Reine Hortense* (1835).

Campaña, käm-pän′yä, town, Argentina, on the River Parana; 40 miles northwest of Buenos Ayres. Industries include petroleum refining and paper making. Pop. 8,000.

Campanari, käm′pa-nä′rē, GIUSEPPE (1858), Italian operatic singer, was born in Venice. He was a 'cellist at La Scala, Milan, when he was engaged by the Boston Symphony Orchestra in 1884. He later sang with the Emma Yuch, Hinrich, and Maurice Grau Opera Companies, and for many years has been a leading singer of the Metropolitan Opera Company.

Died May 31, 1927

Campanario, käm-pä-nä′rē-ō, town, Badajoz province, Spain; 70 miles east of Badajoz city. It has manufactures of soap and woollen and hemp goods. Pop. 7,700.

Campanella, käm-pä-nel′lä, TOMMASO (1568–1639), Italian philosopher, was born in Stilo, Calabria, and entered the Dominican order at the age of fifteen. He became the leader of a political conspiracy to expel the Spaniards from Naples, for which he was imprisoned for twenty-seven years, tried five times, and tortured seven, accused of heresy, and declared the author of a book which had been published thirty years before he was born. In 1626 Pope Urban VIII. had him brought to the prison of the Inquisition at Rome, and three years afterward gave him his liberty and a yearly pension. Campanella went to Paris, where he was graciously received by Louis XIII. and Richelieu, and for the remainder of his life he devoted himself to philosophy. The contemporary of Bacon, like that philosopher he was an opponent of the *à priori* conceptions of the Aristotelian school, and endeavored to ground philosophy on experiment and the observation of nature. He also made an attempt to classify the sciences, and to form a philosophy of history and politics, following out the principle of the indefinite progress of mankind as leading to a universal communion of nations and the extinction of evil.

His chief works were: *De Sensu Rerum* (1620); *De Monarchia Hispanica Discursus* (1640; Eng. trans. 1654); *Philosophia Rationalis* (1638); *Philosophia Universalis seu Metaphysica* (1637);

Civitas Solis (1643; new Eng. trans. 1885), which describes an ideal communistic organization of society on the model of Plato's *Republic*. A new complete edition of his works was published by A. d'Ancona; his sonnets were translated into English verse by J. A. Symonds. Consult Amabile's *Fra Tommaso Campanella* (3 vols.)

Campanero. See BELL BIRD.

Campanha, kăm-pän′yä, city, Minas Geraes, Brazil, 150 miles northwest of Rio de Janeiro. There are hot springs in the neighborhood. Mining is the chief industry. The city has schools, a hospital, and a theatre. The settlement dates from the eighteenth century. Pop. 8,000.

Campa′nia, a province of ancient Italy, coinciding practically with the modern provinces of Avellino, Benevento, Caserta, Naples, and Salerno, with an area of 6,289 square miles, and a population of 3,300,000. The Neapolitan Apennines fill the greater part of the region. The Salernian plain, drained by the Sele, is in great part malarious. The Campania, drained by the Volturno, is very fertile, and has always been densely peopled. The products of prime importance are wheat, maize, wine (celebrated in antiquity—*e.g.*, Falernian), fruits, hemp, silk, and sulphur.

The oldest part of the Campania region known to history is that around Cumæ, a Greek settlement (*Kyme*). The notable cities of the distant past were Naples, Buxentum, Elea (or Velia), Posidonia (afterward Pæstum), Salernum, Puteoli, Caieta, Capua, Volturnum, Nola, Beneventum, Herculaneum, Pompeii, and Stabiæ (the three last buried under the ashes of Vesuvius, 79 A.D.). The chief seat of commerce in Southern Italy in the eleventh century was Amalfi. The vicinity of Cumæ is rich in classic reminiscences, chiefly owing to its attractions (Baiæ, etc.), its associations with celebrated men (Cicero, Augustus, Nero, and Hadrian), and its mythological sanctity (Lake Avernus and the Sibyl's Cave). The Oscans, Etruscans, Samnites, and Romans were successively predominant in this region. In modern times it has shared the destinies of the kingdom of Naples (q. v.).

Campanile, kăm-pä-nē′lā (Italian, 'belfry' or 'steeple'), literally the name of any bell tower, is popularly applied to the tall, graceful, and usually rectangular structures that form a striking adjunct to many churches and palaces of Italy. Among the most famous Italian campaniles are the Leaning Tower of Pisa (q. v.), the Campanile of Giotto in Florence (q. v.), and that of St. Mark's, Venice. There is also the fine campanile of La Giralda in Seville (q. v.), Spain.

Campanile of Florence.—Its erection was begun in 1334, with the object of surpassing in height and in richness of workmanship any of the remains of antiquity. In form it is a parallelopiped, and is of the same dimensions from bottom to top. Though it is very lofty (275 feet) it consists of only four stories, of which the tallest are the uppermost and undermost. The style is Italian Gothic, and the walls are entirely veneered with marble. The original design of Giotto was that a spire of 90 feet in height should have surmounted the present structure, and on the summit may be seen the four great piers from which it was intended that it should have risen.

One of the most remarkable campaniles is the so-called *Leaning Tower of Pisa*, circular in form, and decorated with columns and arcades to the summit of its eight stories. Its construction was begun in 1170, and it was to have been carried up vertically; but the work was interrupted, and when resumed in 1298 it was seen that the part already built had taken a certain slant. To preserve the existing structure the line of inclination was followed, but the horizontal level of the stories was retained by increasing the height of the lower arches. At the opening of the nineteenth century its inclination was 8.6 per cent. of its height; to-day it has reached 9.2 per cent.

Campanile of St. Mark's.—Perhaps the noblest of the Italian campaniles is that of St. Mark's in Venice, founded in 888, added to in 948 and 1148, and completed to the platform in 1170. The *loggia* was added in 1349. Founded upon a rectangular base of Istrian stone, its brick walls taper gently to a height of 200 feet in a series of eight stories pierced with windows. Above the platform rises an open *loggia* of marble 50 feet high, being the actual belfry, wherein hang five great bells of bronze. This is surmounted by a copper figure of an angel 16 feet high, the total height of the campanile being thus 325 feet.

On July 14, 1902, this Campanile suddenly collapsed, and from 1903 to 1911 it was rebuilt as nearly like the old one as possible, the principal modifications being enlarged and strengthened foundations and a powerful hidden framework of iron. The Sansovino *loggia* and the terra cotta Madonna and Child—the latter broken into nearly two thousand pieces—were pieced together and restored to their places, and four of the bells were recast at the expense of Pope Pius x.

Campanini, kăm-pä-nē′nē, CLEOFONTE (1860), Italian operatic conductor and director, brother of Italo Campanini (q. v.) was born in Parma, and studied at the Royal Conservatory there. In 1883 he was engaged as assistant conductor at the Metropolitan Opera House, New York; and was later conductor at Naples, Venice, Rome, London, and Milan. In 1906, on the opening of the new Manhattan Opera House in New York, Campanini was made conductor and artist director; in 1910 he became general musical director, and in 1913 general manager, of the Chicago and Philadelphia Opera Companies. Among his notable productions are *Salome*, *Natoma*, *Thaïs*, *Louise*, *Pelléas et Mélisande*, *Samson and Delilah*.

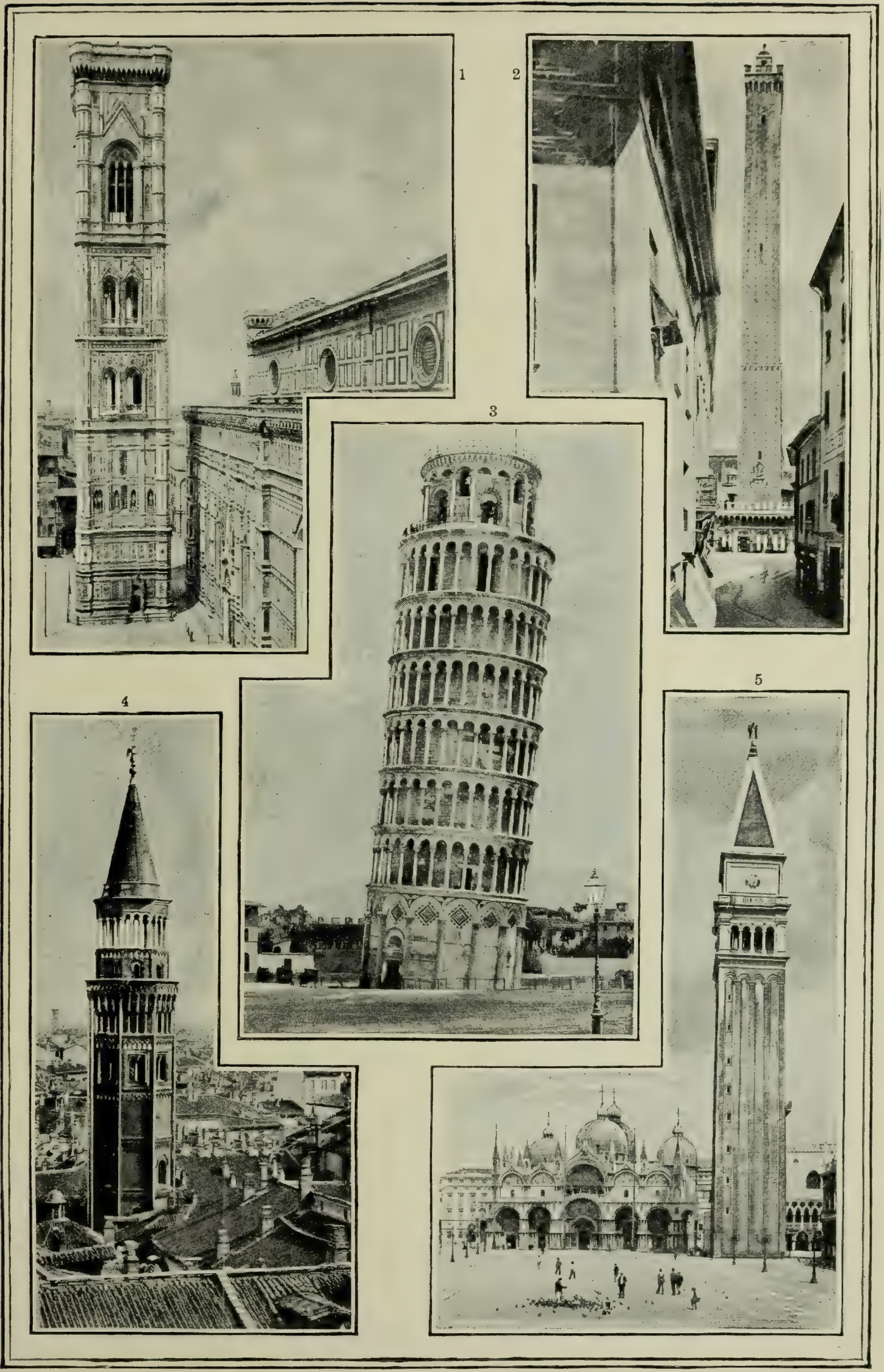
Campanini, ITALO (1846–96) Italian singer, was born in Parma. He served in the army under Garibaldi, and studied and sang in Parma in various companies until 1869. He then studied for two years under Francesco Lamperti, and made his *début* in *Faust* at La Scala in Milan (1871). He appeared at London in 1872 and at New York in 1873, achieving notable success. He made several tours of the United States, and after 1883 lived chiefly in New York. His voice was a true tenor of great power and sweetness, and his repertory comprised about 100 operas and oratorios.

Campanology, the art of bell ringing. See BELL.

Campan′ula, or BELL FLOWER, a genus including about 300 species and numerous varieties. They are confined to the Northern Hemisphere, and find most favorable conditions in England; in America they are less hardy. Most of the campanulas are herbaceous perennial plants; a few are annuals or biennials; while some species, perennial when wild, became biennial when cultivated. The color of the flowers ranges between white and blue, though occasionally a suggestion of pink is seen. In size they vary from the tiny *C. Raineri*, about two inches in height, to the Chimney Campanula (*C. pyramidalis*), often three feet or more.

The annual species may be raised from seed, sown under glass in early spring or in the open border at the end of April. Of the annuals may be named *C. macrostyla*, a purple flowering species about eighteen inches high. Of the biennial kinds, the most important is the *Canterbury Bell* (*C. medium*).

The biennials may be raised from seeds, sown as the annuals. If sown under glass in the month of March, they usually flower the same year; if sown in



FAMOUS CAMPANILES.

1. Florence Cathedral: Campanile by Giotto. 2. Bologna: Torre Asinelli (twelfth century). 3. Pisa: the Leaning Tower. 4. Milan: San Gottardo, by Francesco de Pecorari. 5. Venice: St. Mark's (rebuilt 1903–1911).

April or May, they usually do not flower until the following year. They also may be raised from seeds, may be propagated by division, or in some cases by cuttings.

The following are the most beautiful kinds: *C. pyramidalis*, which bears spikes of blue flowers in July and August, the spikes often three or four feet in height; the Peach-Leaved Campanula(*C. persicæfolia*), about two feet high, with white and blue varieties; *C. punctata*, white, spotted with red; *C. carpatica*, with blue and white varieties, a dwarf; and *C. rapunculus*, a tall bluebell, whose leaves are used for salad. The slender and graceful Harebell, 'the blue bell of Scotland,' is *C. rotundifolia*.

Campan′ula′ria, a common genus of Hydroids, and type of a family, Campanularidæ. The delicate stem bearing the colony of polyps may be simple or branched; the nutritive individuals are surrounded by transparent, bell-shaped sheaths, within which they may be retracted. The mouthless, tentacle-less, reproductive individuals bud off sexual ones, which do not, however, go free as they so often do in allied genera.

Campbell, kam′*e*l *or* kam′bel, family of. See Argyll.

Campbell, Alexander (1788–1866), principal founder of the religious denomination known as the Disciples of Christ, was a native of Antrim, Ireland, and was educated at Glasgow University. He emigrated to the United States in 1809, and in 1811 received a license to preach from the Christian Association, a religious organization founded by his father Thomas Campbell at Washington, Pa. In 1812 he formed a connection with the Baptists, and labored as an itinerant preacher principally in Pennsylvania, Virginia, and Ohio. In 1826 he published a translation of the New Testament in which the words 'baptism' and 'baptist' gave place to 'immersion' and 'immerser.' By his discussions, and by the *Christian and Baptist* and the *Millennial Harbinger*, Campbell gradually formed a large party, who about 1827 organized the Protestant sect known as Christians or Disciples of Christ (see Christ, Disciples of). In 1841 he founded Bethany College in West Virginia, and was its president for twenty-five years. The most important of Campbell's works, besides his translation of the New Testament, are: *The Christian Messenger and Reformer; The Christian System; Christian Baptism*. Consult Richardson's *Memoirs of A. Campbell;* Grafton's *Alexander Campbell*.

Campbell, Bartley (1843–88), American dramatist, was born in Allegheny City, Pa. After an unsuccessful start in a law office, he became a reporter for the Pittsburgh *Leader*. In 1868 he founded the Pittsburgh *Evening Mail*. His first play, *Through Fire* (1871), was a great success, and was followed by *Peril, The Big Bonanza, Matrimony, The White Slave, Siberia, Paquita, My Partner*, which achieved immense popularity in New York, and others. In 1886 he became insane, and was confined to an asylum.

Campbell, Sir Colin, Lord Clyde (1792–1863), British general, the son of a carpenter in Glasgow. He served with Sir Hugh Gough's army in North China (1841), and was conspicuous in the second Sikh War(1849–52). He commanded a brigade in the Crimea, and was mainly instrumental in winning the Battle of the Alma. On the outbreak of the Indian Mutiny (1857) he was made commander-in-chief, and after clearing Lower Bengal, fought his way step by step to Lucknow; then by a masterly campaign in the following spring (1858) completed the capture of Lucknow and the pacification of Northern India. After organizing the successful campaign in Central India under Sir Hugh Rose, he was promoted to the rank of general, created field marshal, and raised to the peerage.

Campbell, Douglas (1839–93), American lawyer and writer, was born in Cherry Valley, N. Y. He was graduated from Union College in 1860; served on the Federal side in the Civil War as a major of colored troops; then studied law in the Harvard Law School, and was admitted to the bar in 1866. He wrote largely on American history. His book, *The Puritan in Holland, England, and America*, first published in 1892, laid down the proposition that the United States obtained her political institutions from the Dutch. Other works by the same author are: *Historical Fallacies Regarding Colonial New York* (1879); *The Origin of American Institutions as Illustrated in the History of the Written Ballot* (1891).

Campbell, George (1719–96), Scottish divine, born in Aberdeen. Becoming (1759) principal of Marischal College, Aberdeen, three years later he published his *Dissertation on Miracles*, controverting Hume's famous argument. In 1771 he became professor of divinity in Marischal College and minister of Greyfriars'. He wrote *Philosophy of Rhetoric* (1776), and *A New Translation of the Gospels* (1789).

Campbell, John, Baron (1779–1861), British jurist and author, was born at Cupar, county of Fife, Scotland. He was called to the bar in 1806, for a time also serving on the staff of the *Morning Chronicle*. In 1841 he was created Lord Chancellor of Ireland, with a peerage, but resigned shortly afterward, on the fall of the Melbourne ministry. He then devoted himself to literature, writing first a work on *Shakespeare's Legal Acquirements*, in order to prove that Shakespeare spent his youth in an attorney's office. In 1846–7 he published his *Lives of the Lord Chancellors*, which was followed in 1849 by the *Lives of the Chief Justices*. In the Whig Cabinet of 1846 Campbell was Chancellor of the Duchy of Lancaster; was appointed Lord Chief Justice in 1850; and became Lord Chancellor of England in 1859. As Chief Justice he presided over the trial of Dr. Newman for libel (1855), and as Lord Chancellor he delivered judgment in the *cause célèbre* of the Emperor of Austria *vs.* Kossuth. Consult the *Life* by his daughter, the Hon. Mrs. Hardcastle.

Campbell, John Archibald (1811–89), American jurist, was born in Washington, Ga., and was graduated from the University of Georgia (1826). He was admitted to the bar in 1829, practised in Alabama, and was a member of the State legislature. In 1857 he was made an Associate Justice of the U. S. Supreme Court; became assistant Secretary of War of the Confederate States (1861); and was one of the commissioners to the Fort Monroe Peace Conference (1865). He published *Reminiscences of the Civil War* (1887).

Campbell, John Francis, of Islay (1822–85), was born in Islay, and died at Cannes. He was a keen and diligent collector of Highland oral tradition, and his *Popular Tales of the West Highlands* (4 vols., 1860–2), together with his *Leabhair na Fenine*('Book of the Fians'), published in 1872, is the best collection of genuine Gaelic tales and ballads. One result of his research was to show that Macpherson's *Ossian* (q. v.) was mostly Macpherson's own creation. He also wrote several records of his travels—*Circular Notes* (1876), *Frost and Fire*, partly scientific (1865), and *A Short American Tramp in the Fall of 1864* (1865).

Campbell, John M'Leod (1800–72), Scottish divine, was born at Kilninver, Argyllshire. Being deprived of his living by the General Assembly on account of his teaching on the personal assurance of salvation and on the universality of the atonement, he worked in the Highlands as an evangelist for two years, thereafter ministering in Glasgow. In 1856 he published a work called *The Nature of the Atonement*, which placed him in the front rank of living theologians. In 1862 he published his *Thoughts on Revelation.* Consult his *Reminiscences and Reflections.*

Campbell, Mrs. Patrick (1867), English actress, born at Kensington, London. After making dramatic tours (1888–91), she attracted special attention by her impersonation of Helen in an amateur performance of *The Hunchback* at Colchester. So favorable was the reception she met in London when playing (1890) in *A Buried Talent,* that in June, 1891, she ventured to take the Shaftesbury Theatre in order to make trial of *Rosalind.* At the Adelphi she created four parts, including Astrea in *The Trumpet Call,* and Tress Purvis in *The Lights of Home.* Next, at the St. James' Theatre, she achieved a brilliant success in the title rôle of *The Second Mrs. Tanqueray.* Other parts in which she has played include those of Kate Cloud in *John a' Dreams,* Agnes in *The Notorious Mrs. Ebbsmith,* Juliet (1895), Lady Teazle, Lady Macbeth (1898), Ophelia, and Magda (1900). She has appeared regularly in America in her most successful plays, including *Hedda Gabler* (1907), *The Thunderbolt* (1908), *Lady Patricia* (1911), *Bella Donna* (1911), and *Pygmalion* (1914). In 1914 she married George Cornwallis West.

Campbell, Reginald John (1867), Congregational minister, was educated at Christ Church, Oxford, and became (1895) minister of Union Street Church, Brighton. After the death of Dr. Parker (1903) he was made pastor of the City Temple, London. He actively opposed the Education Act of 1902, urging all whom he addressed to join in the Passive Resistance movement. Shortly after he inaugurated the 'New Theology' movement, which finally separated him from orthodox Nonconformity. In 1909 he became joint minister of the Weigh House Chapel, London. In the fall of 1911 he visited the United States, and aroused resentment at Philadelphia by his remark that the unsuccessful business man was the honest man. He is the author of *The New Theology* (1907); *Christianity and the Social Order* (1908).

Campbell, Thomas (1777–1844), British poet, was born in Glasgow. He became a tutor in Mull in 1795, and two years later went to Edinburgh, where he found temporary employment in the Register House. Being brought into contact with the literary society of the Scottish capital, he applied himself to *The Pleasures of Hope,* which was published in April, 1799, and met with immediate success. The winter of 1800–1 was spent at Altona, near Hamburg, where he met the hero of his *Exile of Erin.* He returned to England in 1801, sailing past the Danish batteries, the sight of which suggested his famous *Battle of the Baltic.* After one or two visits to London, he settled at Sydenham in 1804. For some time after this he was engaged in anonymous writing and compilation, until his *Gertrude of Wyoming* appeared in 1809.

Returning to hack work, Campbell produced *The Annals of Great Britain,* and lectured on 'Poetry' at the Surrey Institute in 1812. In 1820 he became editor of *The New Monthly Magazine.* His *Theodric* appeared in 1824, only to be met with universal censure. In 1834 he made a trip to Algiers, an account of which may be read in his *Letters from the South* (1837). His last considerable poem, *The Pilgrim of Glencoe,* appeared in 1842, but was not a success. He retired to Boulogne, France, where he died in 1844. He was buried in the Poets' Corner of Westminster Abbey.

Campbell survives almost entirely by his war songs, notably by *Hohenlinden, The Battle of the Baltic,* and *Ye Mariners of England.* Some of his shorter pieces, such as *Lord Ullin's Daughter* and *O'Connor's Child,* reproduce faithfully the style of the new romantic poets, and his *Lochiel's Warning* is still popular in certain circles. Consult William Beattie's *Life and Letters;* also the monograph by J. Cuthbert Hadden in 'Famous Scots Series.'

Campbell, William (1745–81), American soldier, born in Augusta county, Va. In 1767 he removed to the Holston Valley settlement, where he became an officer of militia and took an active part in Indian warfare. During the American Revolution he served for a short time under Patrick Henry. As lieutenant-colonel he led the Virginia militia, and is generally regarded as the directing officer of the heterogeneous American force which won the battle of King's Mountain (q.v.); and he subsequently took a conspicuous part in the Battles of Guilford Court House and Hobkirk's Hill, where he was wounded.

Campbell, William Wallace (1862), American astronomer, was born in Hancock county, O., and was graduated from the University of Michigan (1886). He was professor of mathematics at the University of Colorado (1886–8), and instructor in astronomy at the University of Michigan (1888–91), when he was appointed to the head of Lick Observatory. In this capacity he has done valuable work on the orbits of comets, their spectra, stars and nebulæ, the motions of stars, and solar eclipses. In 1897–8 he had charge of the eclipse expedition to India, and in 1900 superintended the similar expedition to Georgia. He is a member of the National Academy of Sciences and of other learned societies. He has published: *The Elements of Practical Astronomy* (1899); *The Return of Halley's Comet* (1909); *Stellar Motions* (1913).

Campbell, William Wilfred (1861), Canadian poet, was born in Berlin, Ontario, and was educated at the University of Toronto. He studied for the Church of England, but in 1891 entered the civil service at Ottawa, and devoted himself to literature. He is bibliographer of the Dominion Archives and Records Office, and has written a large amount of verse and several poetical dramas. Among his works are: *Lake Lyrics* (1889); *The Dread Voyage Poems* (1893); *Mordred and Hildebrand* (1895); *Sagas of Vaster Britain* (1906); *Canada* (1907); *A Beautiful Rebel* (1909); *The Scotsman in Canada* (1911); *Oxford Book of Canadian Verse* (1914).

Campbell-Bannerman, Sir Henry (1836–1908), British statesman, familiarly known as 'C.-B.' He was Parliamentary representative for the Stirling Burghs from 1868 until his death. His official career began as financial secretary to the War Office (1870–4) in Gladstone's government, and was crowned in February, 1899, by his unanimous election to the leadership of the Liberal Party in the House of Commons on the retirement of Sir William Harcourt. He was again financial secretary to the War Office from 1880 to 1882, when he was transferred to the Admiralty as secretary (1882–4). During the last year of Gladstone's administration (1884–5) he was Chief Secretary for Ireland. On the formation of the Home Rule government (February-July, 1886) he was made Secretary of State for War. In 1892, when Gladstone was again Prime Minister, he resumed his place at the War Office; there he remained, under the subsequent Premiership of the Earl of Rosebery, until the ministry was defeated (1895). In 1897 he was a member of the Jameson Raid Committee, and he strongly disapproved of the war against the Transvaal.

On the resignation of A. J. Balfour's government in December, 1905, Sir H. Campbell-Bannerman was commissioned by the King to form a Liberal Cabinet. His administration brought the question of the status of the House of Lords prominently to the front, and in 1907 he made a memorable declaration that the powers of the Second Chamber ought to be 'so restricted by law that . . . the final decision of the Commons shall prevail.'

Campbellford, town, Northumberland county, Ontario, Canada, on the Trent River and the Grand Trunk Railway; 30 miles east of Peterborough. The river affords excellent water power, and there are manufactures of paper, leather, woollen goods, and flour. Pop. (1901) 2,485; (1911) 3,051.

Campbell Island, an uninhabited, mountainous, peaty, wooded island, nearly 100 square miles in area, the most southerly land of New Zealand, about 145 miles southeast of Auckland Islands. It was discovered in 1810 by Captain Hazelburgh.

Campbellton, seaport, Restigouche county, New Brunswick, Canada, on Chaleurs Bay and the Restigouche River and the Intercolonial Railway; 13 miles southwest of Dalhousie. The town is in the midst of an excellent fishing and hunting territory, and sportsmen from the United States and Canada make it their outfitting point. Fisheries and lumbering offer the chief occupations. In 1910 the place suffered severely from fire. Pop. (1901) 2,652; (1911) 3,817.

Campbeltown, seaport and borough, Kintyre parish, Argyllshire, Scotland; 83 miles southwest of Glasgow. It possesses a splendid harbor, sheltered by Davaar Island (with a lighthouse). The place is a fishing station. Its industries comprise woollen and net factories, shipbuilding, and the distillation of whiskey. Pop. town (1911) 7,626.

Camp du Marechal, commune, Algeria; 45 miles east of Algiers. Pop. 8,300 (Europeans, 200).

Campe, käm′pe, Joachim Heinrich (1746–1818), German educationist, was tutor to Wilhelm and Alexander von Humboldt; became director of the Philanthropin at Dessau (1776–7); and in 1783 conducted a small private school of his own; after which Duke Karl Wilhelm Ferdinand invited him to reform education in Brunswick. In 1779 appeared his *Robinson* (based on Defoe's work), which attained immense popularity (Eng. trans.), and *The Discovery of America* in 1781; and between 1785 and 1791 he issued, in sixteen volumes, his *Allgemeine Revision des Gesammten Erziehungswesens*, a journal to which the best educational authorities contributed, and which did much to popularize and render practicable Rousseau's ideas on education. He then endeavored to purify the German language in his *Wörterbuch der . . . unserer Sprache aufgedrungenen fremden Ausdrücke* (1801). His *Wörterbuch der Deutschen Sprache* (1807–11) contains a large store of words; but its value is otherwise slight, as the general historical knowledge of the language was at the time still imperfect. Consult Leyser's *Life* in German.

Campeador, El. See Cid Campeador.

Campeche, kam-pē′chi, or Campeachy, state of Mexico, occupies the western part of the peninsula of Yucatan. The climate is tropical, and much of the country is covered with forests of valuable woods. The agricultural products are henequen, tobacco, and cotton; rice, beans, and peanuts are also grown. Tropical fruits of all kinds grow luxuriantly, and some indigo is produced. The industries of the country are fishing, agriculture, and stock raising, the gathering of dyewoods, and manufactures of hammocks, mats, and cordage. Logwood (Campeche wood), cotton, indigo, and wax are exported. Area, 18,086 square miles. Pop. (1910) 85,795.

Campeche, or Campeachy (*San Francisco de Campeche*), town and seaport, capital of Campeche state, Mexico, is situated on the bay of the same name; 90 miles by rail southwest of Mérida. It has a citadel, university, naval academy, and shipbuilding docks. The harbor is safe, but shallow. The chief exports are logwood, hemp, cordage, wax, hides, cocoa, and salt. Cigars and palm-leaf hats are the principal manufactures. Pop. (1910) 16,864.

Campeche Wood. See Logwood.

Campeggio, käm-ped′jō, Lorenzo, Cardinal (1474–1539), bishop of Feltri, was sent by Leo X. on a mission to the Emperor Maximilian, being created a cardinal in his absence (1517). Next year he visited England as papal legate to incite Henry VIII. against the Turks. In 1524 he obtained the bishopric of Salisbury and the archbishopric of Bologna, and he presided the same year at the Ratisbon diet. In 1528 he was despatched to England to hear the divorce suit of Henry VIII. against Catherine of Aragon.

Camper, käm′per, Pieter (1722–89), Dutch naturalist and anatomist, was born in Leyden. He was appointed successively professor of medicine and surgery at Franeker (1750), Amsterdam (1755), and Groningen (1763). He made many important discoveries in natural history, among them the auditory organs in fish (1761), the structure of the bones of birds and their relation to respiration, and the anatomical differences between man and the orang-outang. He also studied fossils, and he was the formulator of the 'facial angle' system of measurement in craniology.

Camperdown, village, Netherlands. See Kamperduim.

Camperdown, western suburb of Sydney, New South Wales, Australia, containing the Sydney University and several large colleges and schools, also the Prince Alfred Hospital. Pop. 8,000.

Camperdown, The Battle of. On Oct. 11, 1797, the British Admiral Adam Duncan bore down upon the Dutch, under De Winter, broke through the Dutch line, and engaged closely from leeward. The action was bloody and determined on both sides, and resulted in a decisive victory for the British, who captured seven ships of the line (including both flagships), two 50's, and two frigates.

Camp Fire Club of America, an association of American sportsmen and nature lovers, having for its objects the promotion of local and national measures for game protection and forest preservation, the establishment and maintenance of standards of sportsmanship, the promotion of good fellowship among men of a common interest in the out-of-doors, and the recognition of signal achievements in the purposes for which the club is organized. Founded in 1897 as an informal association of campers and big game hunters, it was reorganized on a more formal basis in 1903, with William T. Hornaday as the first president.

The club has played an important part in rescuing the fur seals from slaughter; in the establishment of Glacier National Park, Montana, and Goat Mountain Park, British Columbia; in the promotion of Federal laws for the protection of migratory birds, and the prohibition of the importation for millinery purposes of wild birds' plumage; and in other State and national movements for conservation. The headquarters are in New York City, and the official organ is *Field and Stream.* President, George D. Pratt; secretary, Arthur F. Rice.

Camp Fire Girls of America, an organization of girls and young women between the ages of twelve and twenty years and upward, which aims to add the power of organization and the charm of romance to health, work, and play, particularly through the use of certain ceremonies, costumes, and symbols evolved from American Indian lore. Particular emphasis is placed upon out-of-door life, and an essential feature of the plan is a season spent in the open air, under camp influences. The order was established in March, 1912.

The members are organized into Camp Fires of not less than six and not more than twenty members, each under the direction of a Guardian of the Fire, who receives her appointment from the National Board of Directors. Any girl of twelve years or over is eligible for membership, and may be received on probation by expressing her determination to follow the Law of the Camp Fire—to seek beauty, give service, pursue knowledge, be trustworthy, hold on to health, glorify work, and be happy. Full membership is of three ranks—Wood Gatherers, Fire Makers, and Torch Bearers—to be progressively attained by meeting specified requirements and by winning a certain number of elective honors chosen from the divisions of health craft, home craft, nature lore, camp craft, hand craft, business, and patriotism. Honors are symbolized by distinctively colored beads, which are awarded the members in recognition of attainment.

The symbol of the general organization is fire, for around it the first homes were built; the symbol of membership is the standing pine. The watchword is *Wohelo*, made up from the first two letters of the words Work, Health, and Love. In addition, each Camp Fire and each Camp Fire girl has a special name and symbol. Ceremonial meetings, or council fires, at which the ceremonial costume is worn and a prescribed ritual followed, are held once a month or oftener.

The Camp Fire Girls of America is a self-supporting and self-governing organization. Each girl pays 50 cents annual dues. She is urged to earn this money herself. The administration rests in the hands of a board of directors elected annually by the corporation, or board of electors, which includes the guardians of all camp fires and a number of additional members especially elected. On Oct. 31, 1916, there were 6,113 Camp Fires in good standing, with a total membership of 79,669 girls and 6,113 guardians. Headquarters, 461 Fourth Ave., New York City. President, Luther H. Gulick.

Camphausen, kämp'hou-*z*en, OTTO VON (1812–96), Prussian statesman, born at Hünshoven, near Aix-la-Chapelle. He was elected to the second chamber (1849), where he joined the Moderate Liberal Party. As Minister of Finance from 1869 to 1878 he succeeded in transforming a large annually recurring deficit into a surplus, and, with the aid of the French war indemnity, considerably reduced the national debt, these services earning for him the appointment of vice-president of the ministry (1873–8). His strong adherence to free trade principles resulted in continual conflict with Bismarck, and finally caused his retirement.

Camphausen, WILHELM (1818–85), German historical and battle painter, was born at Düsseldorf, and became a representative of the local school of art. His works are accurate, but monotonous in theme, and comprise: *Cromwell's Guard Watching the Approaching Enemy* (1846); *Puritans with a Convoy of Prisoners; Charles II. Escaping After the Battle of Worcester* (1849); *Charles I. at the Battle of Naseby* (1852); *Morning Watch of the Puritans* (1852). He afterward executed a great number of paintings of Frederick the Great's wars, the Schleswig-Holstein campaign of 1864, the Austro-Prussian War of 1866, and the Franco-German War of 1870. Of the last series may be mentioned the two colossal canvases, *Wilhelm I. on a Battlefield, Accompanied by Roon, Bismarck, and Moltke* (1872), now in the Cologne Gallery, and *Wilhelm I. with Moltke* (1873). Other well-known compositions of his brush are: *The Meeting of Bismarck and Napoleon III.; The Entry of the Victorious Army into Berlin.*

Camphene, kam'fēn ($C_{10}H_{16}$), a solid hydrocarbon, crystallizing in white prisms, and prepared by heating pinine hydrochloride or artificial camphor with sodium stearate. It smells like turpentine and camphor, and exists in a dextro and lævo modification.

Camphine, kam'fin, *or* -fēn, the trade name of a purified spirit of turpentine, formerly used for burning in lamps, and generally prepared by distilling good turpentine with quicklime.

Camphor, kam'fer, a volatile, semi-transparent, crystalline substance, with a characteristic penetrating odor and an aromatic, cooling taste, obtained from various species of laurel, notably the Camphor Laurel (*Laurus* or *Cinnamomum camphora*). It dissolves slightly in water (1–1,000), and readily in ether or alcohol; melts at 175° c.; boils at 204° c.; and burns with a bright flame and much smoke. Its specific gravity is slightly less than that of water. Chemically it is a ketonic derivative of paracymene, and is represented by the formula $C_{10}H_{16}O$.

The camphor tree is a handsome, dense topped tree growing to a height of forty to sixty feet. It is a native of Southeastern Asia—notably China, Japan, and Formosa—whence its cultivation has been introduced into Ceylon, Malaya, and Italy. In the United States it has been grown as an ornamental tree in the Southern and Southwestern States, and is cultivated on a commercial scale in Florida.

The bulk of the camphor of commerce comes from Japan and Formosa, where, according to the traditional method, the wood is cut into chips and distilled with water; the vapor of the camphor rises from the steam, and is conducted to a receptacle, where it is allowed to cool and condense; and the oil of camphor is allowed to drain off. In the refining process the impure camphor is mixed with a small proportion of quicklime, is reheated, and allowed to sublime and resolidify. Recent investigations having proved that the leaves of the camphor tree yield more camphor and oil of camphor than the wood, and that their proper harvesting does no injury to the tree, methods of distillation have been modified accordingly.

Other natural varieties of camphor are Peppermint Camphor, or Menthol (q. v.); Thyme Camphor, or Thymol (q. v.); Borneol ($C_{10}H_{18}O$), occurring as coarse crystals in the wood of *Dryobalanops camphora;* and Blumea or Ngai Camphor, distilled from the leaves of *Blumea balsamifora*, little known outside of China.

Artificial or *Synthetic Camphor* is prepared by a number of processes based upon the conversion of pinene, a hydrocarbon existing in the volatile oil of turpentine. By most of these, pinene hydrochloride is converted into borneol or isoborneol ($C_{10}H_{17}OH$), and the product oxidized into commercial camphor.

Camphor has been used for many years as an insecticide and in medicine. Applied externally it is a counter-irritant, a local anæsthetic, and an antiseptic. Internally it is a nerve stimulant and a fever specific. In more recent times it has been extensively employed in the manufacture of celluloid (q. v.) and of high explosives. Importations into the United States in 1915 amounted to 3,729,207 lbs. of the crude and 1,170,666 lbs. of the refined product, valued at $1,003,261 and $417,861, respectively.

Camphuysen, kämp'hoi-*z*en, DIRK RAFAELSZ (1586–1627), Dutch poet, born at Gorinchem, was a teacher and pastor (1616), but was deprived (1619) of his living because of his Arminian views. He wrote *Stichtelijke Rijmen* (1625), and numerous other editions, mostly religious poems in a simple style characterized by some natural force. There is a *Life* in Dutch by Kindermann.

Campi, käm'pē, a family of artists of Cremona in Italy. **(1.)** GALEAZZO CAMPI (1475–1536), painter, was the father of three more famous sons. **(2.)** GIULIO CAMPI (1500–72), painter, influenced chiefly by the style of Giulio Romano, has left fine specimens of his art at Cremona and Milan. **(3.)** AN-

TONIO CAMPI (1536–91), architect, painter, and historian, not only added to the valued paintings of Cremona and Milan, but composed a *Chronicle* (1585) of Cremona adorned with plates of his own engraving.

(**4.**) VINCENZO CAMPI (1532–91) devoted himself to portraiture and still life.

(**5.**) BERNARDINO CAMPI (1522–90) may have been related to Galeazzo and Vincenzo. His works show study of his master Giulio Romano, and of Titian, Correggio, and Raphael. His great work in the cupola of San Sigismondo represents the assembly of Old and New Testament saints. In the Louvre is his *Mater Dolorosa*.

Campi Bisenzio, käm′pē bē-zent′sē-ō, town, Tuscany, Italy, in the province of Florence; 7 miles northwest of Florence. It has tile and iron works. Pop. (commune) 14,000.

Campidano, käm-pē-dä′nō, the fertile plain in Sardinia which stretches across the island from the Gulf of Cagliari, in the south, to the Gulf of Oristano, in the west, and produces especially wine, fruits, and cereals. It is hot, dry, and in parts malarious.

Campiglia Marittima, kȧm-pe͞el′ya mar-rit′te-ma, commune, Italy, in the province of Pisa; 35 miles southeast of Leghorn. Lead, iron, and copper are mined. Pop. 8,000.

Campillos, kȧm-pe͞el′yos, commune, Spain, in the province of Malaga; 35 miles northwest of Malaga. It manufactures cloth and leather. Pop. (1920), 5,938.

Campinas, käm-pē′näsh, city, Brazil, in the state of Sao Paulo; 55 miles northwest of Sao Paulo city. It has one of the finest churches in Brazil—the Church of the Conception, a hospital, a theatre, three libraries, and a hippodrome. There are large coffee and sugar plantations in the surrounding district, and machinery, agricultural implements, hats, and cotton goods are manufactured. Pop. 15,000.

Camping, a form of recreation which generally implies living more or less simply out of doors, with a tent of some kind for shelter.

The camp site should be near wood and water, to supply fuel and drink. The tent should be pitched on well drained rising ground, partly shaded if possible but near the open. Dense woods or thickets are undesirable, and dead timber is a breeding place of dampness. Tents vary greatly in style, size, and material, according to the climate, the number in the party, and transportation facilities. For a permanent camp the wall-tent, which is quickly put up, is considered by many the most practical form of shelter. Another popular tent is the 'Dan Beard' tent, which is practically a wall-tent with one side sheared off about 2 feet beyond the ridge, the place of the side being taken by a veranda flap which can be closed down or guyed out horizontally, permitting an open camp fire in front. Other excellent tents are the miner's tent, with or without walls, pyramidal in shape and adaptable for open country; the 'Baker' or shelter tent, a good light-weight tent, fairly spacious and comfortable; and the Forester tent, the lightest and warmest of all tents, easy to construct and easy to pitch, requiring 8 pegs, 3 poles, a ridge-pole, and a pair of shears.

The next important consideration is the camp fire, both for purposes of warmth and for cooking. There are various types of fires, adapted to various kinds of camps: the back-log fire, virtually a log hearth which burns all night; the Indian fire, a circle of logs with the fire in the centre, easily made and easily replenished; the teepee fire, similar to the Indian fire but of fewer and larger logs; and the snow fire, built to burn on a snow bank and yet not be extinguished by the melting snow beneath. For cooking, the simplest device is the log range made by two logs set on the ground near together so as to form a support for the bottom of the utensils, and having a small trench underneath, in which are placed kindling and small logs. A wind guard or radiator formed of logs placed at the back improves this fireplace. If stones or turf are available, what is known as a Matisiso stove is excellent. This is made by building a pier of stones about 3 feet high, and leaving a hollow in the centre for a fireplace, with a bottom of turf.

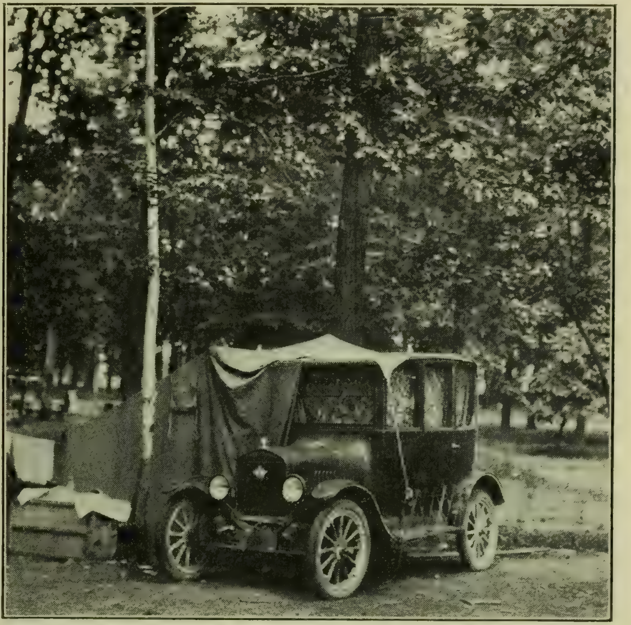


Photo from Edward Levick, N. Y.

A Motor Camping Tent

The camp bed is of several varieties. A canvas sack, filled with hay and stretched between two poles resting on logs in which notches have been cut to hold them firmly, makes a comfortable bed when blankets are placed below and above the sleeper. Another good camp bed, called the 'browse bed,' is made by filling a canvas bag with pine boughs, dead leaves, or any kind of young browse. Sleeping bags of various kinds, stretcher beds, air mattresses, and Indian stick beds, made of kinnikinic, on which is laid a sleeping bag, blanket, or deer skin, are other popular arrangements.

Equipment for a camping trip varies with the time of year, the location of the camp, the size of the camping party, and other matters, but in general it should include, beside the tents, beds and blankets, a cook-kit, of which there are several on the market, a medicine kit, warm, light, and durable clothing, a clock, a lantern or flashlight, if possible a hay-box cooker, matches, soap, an axe, and such canned food as will be necessary to supplement what is likely to be obtained by hunting and fishing. Milk and eggs are often obtainable within a reasonable distance.

Motor Camping.—A popular form of camping, coincident with the growing use of the motor car, is motor or auto camping. Outfitting for a motor camping trip, as for any other camping trip, varies with the size of the car and the number in the party. The fundamental considerations are the comfort of the passengers, compactness of equipment, its protection against rain and dust, its security in attachment, and the best running conditions for the car. Many of the outfits used in motor camping are combination beds and tents. In some cases these are set up apart from the car, in others they are attached to it; some can be used in either way. Generally the tent part is merely a shelter for the bed and has little or no room for living space. Auto campers who desire a maximum of comfort use a trailer, weighing between 500 and 800 pounds, which is towed behind the car, bearing tents, beds, provisions, and utensils, and leaving the car itself free from clutter.

Many towns and cities throughthe Western United States and some in the East maintain camping grounds for motor tourists. In Southern California there are more than fifty such grounds; and Vancouver, Banff, and other Canadian cities offer similar facilities. Often the section is in a city park and in all cases the campers find numerous accommodations, as electric lights, stoves, water, toilet facilities, and sometimes even chairs and tables. In most cases the accommodations are free, but the length of stay is sometimes limited. The National Parks and Forests welcome the motor camper and offer many aids for his comfort; in many States the same courtesies are extended in the wild open spaces under State control.

Organized Camping.—The last twenty-five years, with its increase in wealth, shorter working hours, extension of National Park and Forest areas, and greater attention to the benefits to be derived from fresh air and exercise, have witnessed a great development in agencies devoted to the promotion, for brief periods at least, of out-of-door living. These agencies may be generally divided into three classes: (1) private individuals and organizations conducting camps for profit; (2) private organizations conducting camps without profit; and (3) public associations providing opportunities for camping. The private camps are of three general types, boys', girls', and adults'. The first organized camp for boys was founded in 1881. For twenty years the progress of this movement was slow, but the last two decades have seen a rapid growth, and there are now some 300 private camps for boys in the United States. The first private camp for girls is credited to Dr. and Mrs. Gulick, who in 1888 established a camp in Maine for their own daughters, from time to time admitting other girls on a paying basis. The growth of girls' camps has been extremely rapid, and they now number approximately 260. The private camp for adults is still in its infancy. There are some 65 or 70 now in operation, purely commercial ventures, many of them really decentralized hotels.

The majority of organized camps in the United States are conducted by private organizations for civic, social, recreational, or educational purposes

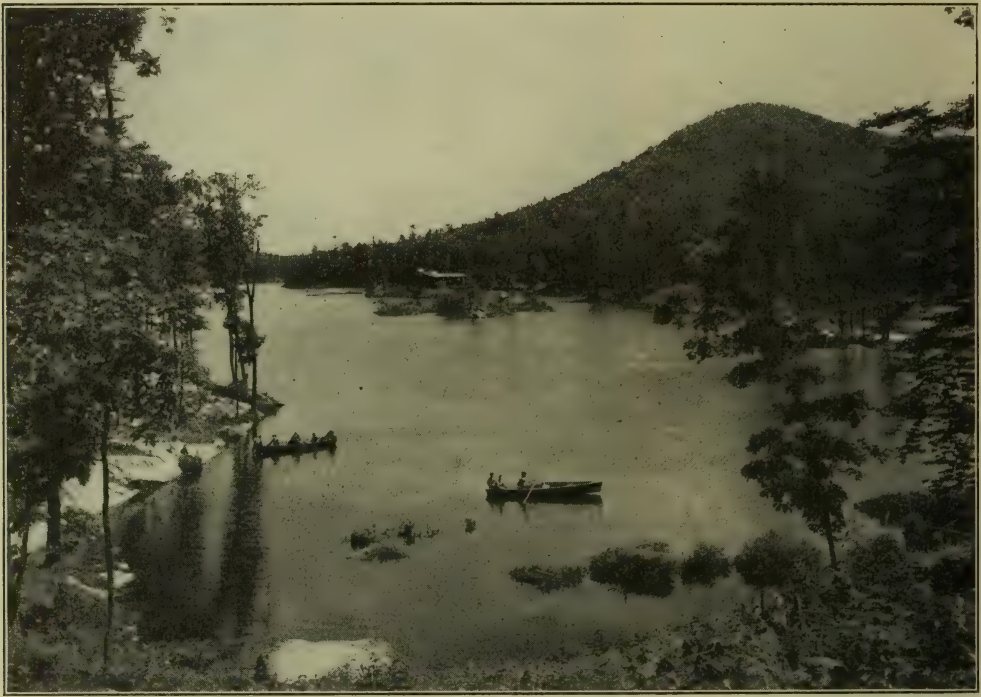


Photo by Ewing Galloway, N. Y.

Water Sports at a Girls' Camp

the fees being usually only enough to cover the actual cost of operation. Chief among the organizations establishing such camps are the Y. M. C. A., Y. W. C. A., Boy Scouts of America, Camp Fire Girls, Girl Scouts, Federation of Boys' Clubs, Federation of Girls' Clubs, Woodcraft League of America, and the American Legion. Many large city churches conduct summer camps for their children and poorer parishioners, as do many social agencies, newspapers, magazines, and commercial clubs.

The public agencies providing opportunities for camping include municipal, county, State, and the National governments. During the past decade a number of municipalities have established organized camps. They usually enroll both boys and girls, as well as mothers and small children, and are generally under the control of municipal recreation departments. Municipalities have also shown much interest in establishing tourist camps for motoring parties and there are more than 2,000 of these in the United States (see above). County governments have not as yet become an appreciable factor in the camping question, and the State governments are concerned chiefly through their park and forestry departments, promoting camping by the building of roads, construction of trail shelters, providing police and sanitary protection, and developing certain areas for motor camping. The National Government aids in the promotion of camping in like manner, working through the Bureau of Forestry, the National Park Service, and the War Department.

In practically all organized camps a more or less definite programme of work and play is carried out, varying with the type and location of the camp. In general it includes horseback riding, swimming, hiking, games, religious exercises, and educational work as exemplified in a study of woodcraft, dramatic entertainments, pageants, basket making, bead and leather work, nature study, and other activities. Good leaders, or counsellors as they are called, are of prime importance in an organized camp.

Consult Miller's *Camp Craft* (1915); Gibson's *Camping Out for All* (1919); Jessup's *The Motor Camping Book* (1921); Brummer's *Autocamping* (1923); Brooks' *A Handbook of the Outdoors* (1925); Wack's *The Camping Ideal* (1925).

Campion, kȧm′pi-un, the common name of plants belonging to the genera Lychnis and Silene (qq. v.).

Campion, EDMUND (1540–81), English Jesuit, was born in London. During a visit to Dublin he advocated the cause of Irish education in a pamphlet called a *History of Ireland* (1569). After studying in the English College at Douai, he openly recanted (1572) Protestantism, and was chosen by the Society of Jesus for the mission to England (1580), during which he preached with such effect that wavering Catholics drew to him in crowds. At the same time he wrote the *Decem Rationes* (1581), against the Protestants. Betrayed to the government, he was thrice put to the torture, and was hanged at Tyburn. He was beatified in 1886. Consult Simpson's *Life*.

Campion, THOMAS (*c.* 1567–1620), English poet and composer of music. He seems to have become a member of Gray's Inn, but turned from law, and practised as a physician. About 1593 he was known as a poet, both in Latin and in English. Between 1601 and 1617 he published a series of exquisite song books, writing both words and music. He also wrote on the theories of poetry and counterpoint, and worked with Inigo Jones in the production of court masques. His works include: *Epigrams* (Latin, 1595, 1619); *A Book of Airs* (with Philip Rosseter, 1601); *Songs of Mourning* (1613); *Two Books of Airs* (*c.* 1613); *Third and Fourth Books of Airs* (*c.* 1617); *Observations in the Art of English Poesy* (1602). His *Collected Works* were edited by Bullen in 1889, by P. Vivian in 1908.

Campi Raudii, kȧm′pī rô′di-ī, the Raudian Plains, in the north of Italy, near Vercellæ. In 101 B.C. a great victory was won there by Marius and Catulus over the invading Cimbri and Teutones.

Cam′pli, commune, Italy, in the province of Abruzzi; 6 miles northeast of Teramo. Tanning and cattle raising are industries. Pop. 10,000.

Camp Meetings, religious gatherings, of several days duration, held out of doors in temporary encampments. In earlier times they were often marked by emotional preaching and much religious excitement. They were originated by the Methodist Church in Kentucky in 1799, for the benefit of people living in sparsely settled districts. About the same time Hugh Bourne, an English Wesleyan, began a series of open-air meetings in North Staffordshire, England; and following a visit of Lorenzo Dow, an eccentric American, these became (about 1807) typical camp meetings. The English Wesleyan Conference disapproved, and for this and other reasons Bourne and his followers founded the Primitive Methodists (see METHODISM). In America Presbyterians and Baptists at first took part in the camp meetings, but they soon became distinctively Methodist.

In recent years the meeting grounds have become fixed, and have developed into exceedingly valuable properties (as at Ocean Grove, N. J., Round Lake, N. Y., and many other places), taking on the character of summer resorts; while the rude preaching and disorders of the early time have disappeared, and various educational features have been added. Consult Swallow's *Camp Meetings;* James' *Varieties of Religious Experience*.

Campoamor y Campoosorio, käm-pō-ä-mör ē käm-po-o-sō′rē-ō, RAMON (1817–1901), Spanish man of letters and legislator, was born in Navia, Asturias. He was one of the most popular poets in Spain, and claimed to be the creator of two new *genres* of poetry, the *dolora* and the *pequeño poema*. The *doloras*, his first collection of which appeared in 1856 (18th ed. 1890), illustrate or enforce some moral or philosophical idea; while the *pequeño poema* is a novel or novelette in verse, turning upon a social or psychological theme. Collections of *pequeños poemas* appeared from 1879 on, among the most celebrated being *La niña y el nido*, *El tren express*, *Los grandes problemas*. Other works include *Nuevos poemas* (1892); *El idealismo* (1883), an exposition of philosophical principles; *El drama universal* (1873 and 1891), a lengthy poem; the dramas *Dies Iræ* (1873) and *Glorias humanas* (1885); and the comedies, *Cuerdos y locos* and *El honor*. The author's best productions, however, are his lyrical works (e.g., *Obras poéticas*, 1900), some of his shorter sentimental poems being notable for their highly polished diction and subtle thought. Campoamor was an eloquent speaker in the Cortes, in which he sat for several years. Consult Boris de Tannenberg's *La poésie Castellane contemporaine*.

Campobasso, käm-pō-bäs′sō (formerly MOLISE), province of Italy, stretching from the South Apennines to the Adriatic; area 1,692 square miles. Sheep and cattle grazing is the chief industry in the mountainous parts. The coastlands and lower valleys yield wheat, corn, wine, olives, and hemp. Cutlery, paper, hats, and silk are manufactured. Pop. (1921) 340,909.

Campobasso, town, capital of the province of Campobasso, Italy; 52 miles north of Benevento by railroad. It lies in the heart of the Neapolitan Apennines, has several fine churches, and manufactures cutlery. Pop. (1921) 16,330.

Campobello, kam-pō-bel'ō, island in the Bay of Fundy, New Brunswick, Canada, at the entrance to Passamaquoddy Bay. It is about eight miles long and three miles wide, and has a picturesque rocky coast. It is a popular summer resort. Pop. (1921) 1,250.

Campobello di Licata, town, Girgenti province, Sicily; 17 miles north of Licata by railroad. It is situated in a fertile district near large sulphur mines. Pop. 12,000.

Campobello di Mazzaro, town, Sicily, in the province of Trapani; 32 miles southeast of Trapani. It has famous quarries, which yielded the material for the temples of Selinus, constructed in the fifth century B.C. Pop. 9,000.

Campodea, kam-pō'di-*a*, a small insect—widely distributed over the world—which has acquired considerable importance from the fact that it has been supposed to be the nearest living representative of the ancestral insect. See Thysanura.

Campo de Criptano, kam'pō dā krip-tä'na, town, Spain, in the province of Ciudad Real; 80 miles southeast of Madrid. Pop. (1920) 12,772.

Campo Formio, käm'pō for-mē-ō, village, Venetia, Italy; 6 miles southwest of Udine. Here, on Oct. 17, 1797, peace was signed between Austria and Napoleon at the end of his first Italian war.

Campomanes, käm-pō-mä'nās, Pedro Rodriguez, Count of (1723–1802), Spanish statesman and writer, was born in Asturias. He held successively the offices of president of the Cortes, director of the Royal Academy of History, and minister of state, but retired from public life on the accession of Charles IV. He wrote the first Spanish work of any value on political economy, and to his efforts are due several of the most important economic measures in Spain, such as the creation of a national bank, the opening of Spanish ports to foreign trade, the free importation of raw materials, and the foundation of agricultural and industrial societies.

Campos, käm'po͝osh, a Brazilian word for *savannas*, or stretches of land intermediate between forest and grass land, in climates transitional between the temperate and the tropical. The *llanos* (q. v.) are similar to the campos.

Campos, city, state of Rio de Janeiro, Brazil, on the Parahyba River, connected by rail (37 miles) with the port of Sao Joao do Barra, at its mouth; 150 miles northeast of Rio de Janeiro. After the capital, it is the largest and healthiest city of the state. It is an important railroad centre, and has an active export trade in sugar, coffee, and rice. Pop. 50,000.

Campos, Arsenio Martinez de (1831–1900), Spanish general and statesman, was born in Segovia. He distinguished himself in the Morocco campaign of 1859–60; served in Cuba from 1869 to 1872; and commanded against the Carlists (1870 and 1873). Returning to Madrid, he, with General Jovellar, succeeded in placing Alfonso XII. on the throne (1874), after which he finally defeated the Carlists at Peña de Plata (1876), thus ending the civil war. Appointed commander-in-chief of the army in Cuba (1877), he was uniformly victorious. Thereafter he was successively minister of war (1879 and 1881–3), president of the Senate (1885), minister of war (1887), captain-general of Madrid (1888). Returning to Cuba in 1895 to quell disturbances rekindled by the refusal to grant reforms, he was unsuccessful, and was replaced by General Weyler. On his return he became governor of Madrid and president of the Senate, and during the minority of Alfonso XIII. was the trusted adviser of the queen-regent.

Campo Santo ('holy field'), käm'pō sän'tō, the Italian and Spanish name for a cemetery or burying ground, especially for one enclosed by an arcade. The walls of the famous Campo Santo of Pisa are covered with frescoes by early painters; that of Genoa has some fine sculpture.

Campos-Salles, käm'po͝osh sä'lesh, Manoel Ferraz de (1840–1913), Brazilian statesman, was born in the state of Sao Paulo. Upon leaving college, in 1864, he entered the profession of journalism, and later became active in politics. During the Brazilian Empire he was a member of Parliament, where he was known as the 'Gambetta of Brazil.' He was successively Minister of Justice under the Republic, and governor of the state of Sao Paulo, and in 1898 became President of Brazil, serving until 1902.

Campu-Lung, käm-po͝o-lo͞ong', or Kimpolung, town, Roumania, capital of the province of Muscel, near the Carpathians; 80 miles northwest of Bucharest. It has Roman remains, and was the first capital of Walachia, in the fourteenth century. Pop. 13,500.

Campus, a Latin term signifying 'a field,' subsequently limited to a large vacant space near a town, where games, shows, and assemblies could be held. In the United States, the term is used for a college green.

Camtoos. See Gamtoos.

Camuccini, kä-mo͞ot-chē'nē, Vincenzo (1775–1844), Italian painter, was born in Rome. The school of which he became the head was founded on the theatrical antique style of the French painter David. His *Incredulity of Thomas* was copied in mosaic for St. Peter's.

Camulodunum, the old Roman name of Colchester (q. v.).

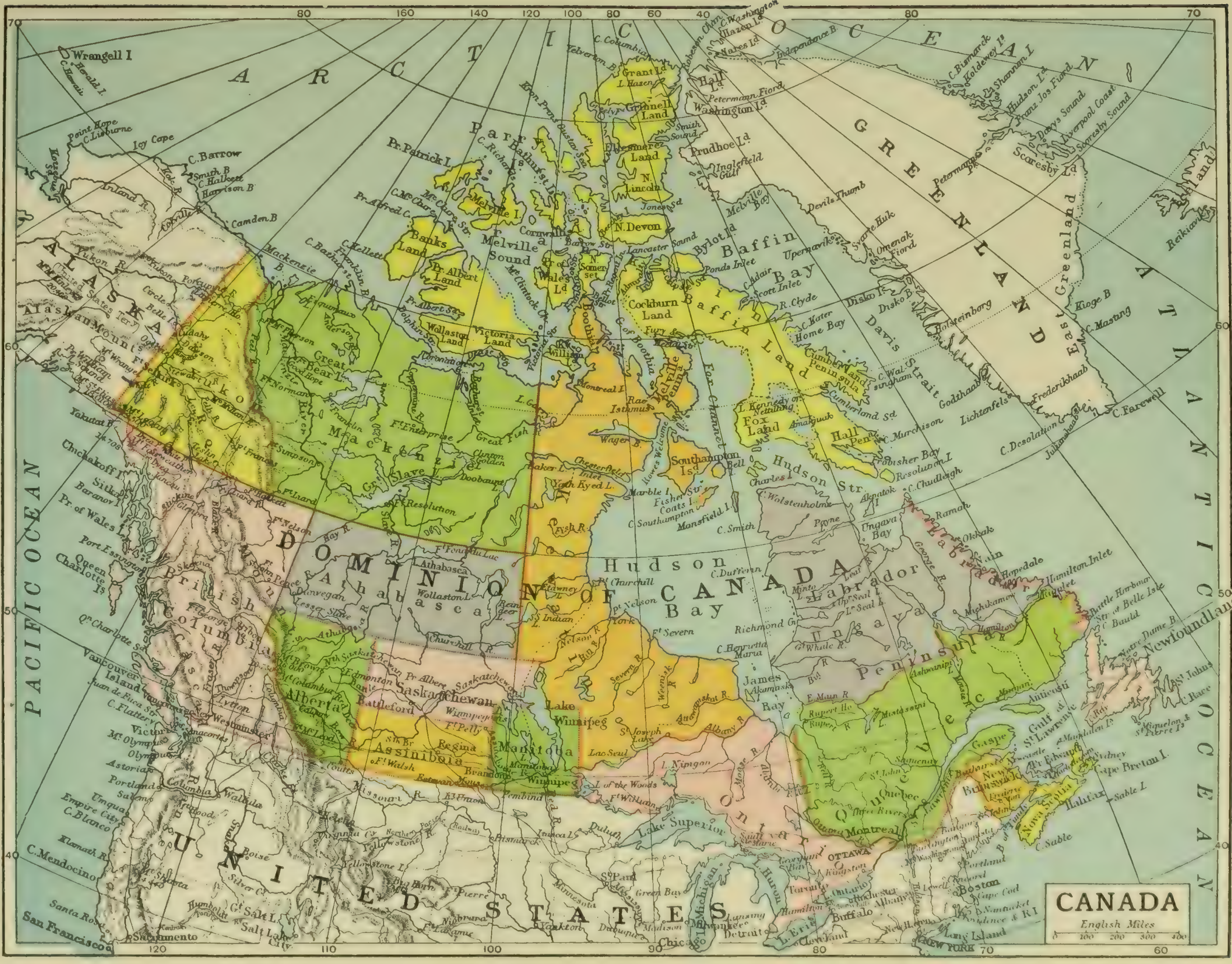
Camus, kȧ-mü', Armand Gaston (1740–1804), French revolutionist, was born in Paris. At the Revolution he was elected a deputy to the States-General and to the National Convention, and was one of the accusers of Louis XVI. He was also appointed keeper of the archives, and preserved the records from destruction. When sent in 1793 to arrest Dumouriez he was seized and given up to the Austrians, but after thirty months' imprisonment was liberated by exchange. In 1796 he was president of the Council of Five Hundred.

Cam'wood, a wood from which an important red dye is obtained. The tree (*Baphia nitida*) is a native of Angola, West Africa, and is leguminous.

Cana of Galilee, kā'nä, the scene of Christ's first recorded miracle, and the birthplace of Nathanael, was situated near Capernaum, west of the Sea of Galilee. Two modern villages claim to represent the site. The one, now Kefr Kenna, is 4½ miles northwest of Nazareth; the other, Kana el Jelil, is 9 miles north of Nazareth.

Canaan, kā'n*a*n ('low land'), the name originally applied to the low coast land of Palestine on the Mediterranean, inhabited by the Canaanites (strictly so called), as opposed to the mountain land (*cf.* Num. xiii). In this original sense the name is still applied in Isa. xxiii. 11 to the Phœnician, and in Zeph. ii. 5 to the Philistine coast land. At a later period, the name Canaan became extended to the whole country. See Palestine.

Canaanites, according to Gen. x. 15 *f.*, the descendants of Canaan, the son of Ham and grandson of Noah, who inhabited Palestine previous to the Israelite invasion. In the Old Testament, the name is frequently used to include all the heathen between the Jordan and the Mediterranean. In the time of the Patriarchs they were already civilized, and living in towns; and by the time of Joshua their country was studded with walled cities, each under a king. Their religion was a licentious worship of Baal and Ashtoreth, as the productive powers of nature. Their subjugation was effected only by degrees. In some passages of the Old Testament Canaanites stands for the Phœnicians. See Palestine; Phœnicians; Hittites.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DOMINION OF CANADA
ALASKA
UNITED STATES
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Baffin Bay
Davis Strait
Hudson Str.
Fox Channel
James Bay
Labrador
Ungava Peninsula
Quebec
Ontario
Manitoba
Assiniboia
Saskatchewan
Alberta
Athabasca
British Columbia
Mackenzie
Yukon
Keewatin
Newfoundland
Nova Scotia
New Brunswick
Gulf of St. Lawrence
Baffin Land
Cockburn Land
Banks Land
Victoria Land
Wollaston Land
Pr. Albert Land
Melville I.
Melville Sound
Parry Is.
N. Devon
Ellesmere Land
Grinnell Land
Grant Ld.
N. Lincoln
Southampton Isd.
Melville Penla.
Boothia
Cumberland Peninsula
Hall Penla.
Fox Land
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Great Bear L.
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C. Desolation
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Frederikshaab
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Red R.
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Churchill R.
Nelson R.
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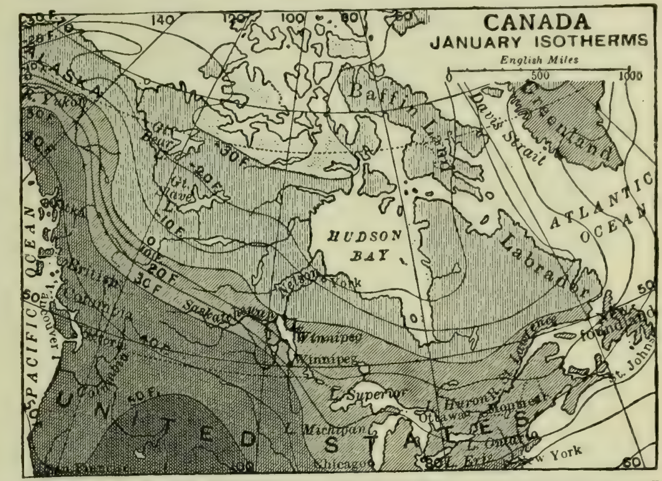
Canada, DOMINION OF, comprises the whole of the northern half of the North American Continent, with the exception of Alaska, which belongs to the United States, and Newfoundland with its dependency Labrador, the boundaries of which were extended by the award of the Judicial Committee of the British Privy Council, on Mar. 1, 1927, at the expense of Canada. From east to west Canada is divided into the following provinces: Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia. The remainder is included in the two territorial districts of Yukon and the Northwest Territories. The provinces and districts thus comprised in the Dominion of Canada cover an area of 3,684,723 square miles, of which 142,674 is water. This is somewhat greater than that of the United States (including Alaska but not the insular possessions) and a little less than that of Europe.

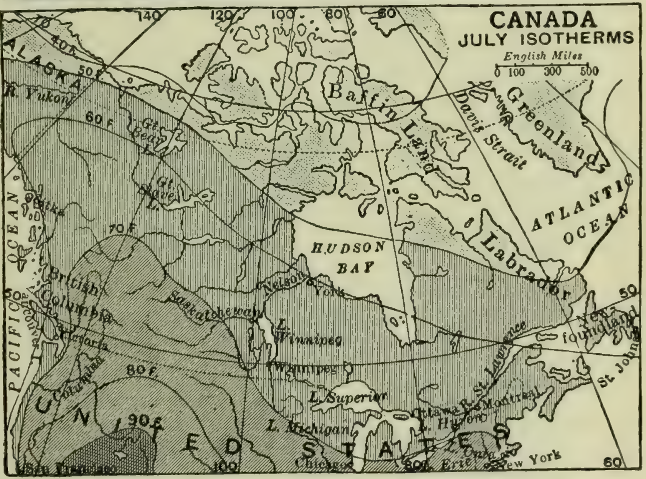
Topography.—So far as physical features are concerned, the Canadian half of the continent may be divided into four regions: (1) In the east, and including the larger part of the Maritime Provinces, the hills and lowlands are a continuation of the Appalachian Highlands. (2) Westward, and covering an immense portion of the country, is the Laurentian region, including the provinces of Quebec and Ontario and the eastern part of Manitoba, as well as the land north of these provinces. (3) Next comes the great unwooded plain of Western Manitoba, Southern Saskatchewan, and Southern Alberta, extending to the base of the Rocky Mountains. (4) British Columbia forms the fourth and last division, a veritable 'sea of mountains,' running parallel to the coast and enclosing many fertile valleys.

(1) In the Appalachian region the ranges of hills run from northwest to southeast, and are of later formation than the Laurentian hills. That portion bordering on the Bay of Fundy is fertile, especially the parts reclaimed from the sea by dikes. Most of the uncultivated land, particularly in New Brunswick, is heavily wooded. The coast line is much indented, offering numerous secure harbors to the trading and fishing population.

(2) The Laurentian region, from a geological point of view, is the nucleus and backbone of the continent. This great extent of territory nowhere attains any great height, although it presents some bold ranges of hills along the sea coast. South of the plateau region is a great lowland area, embracing the valley of the St. Lawrence River and the peninsular portion of Ontario. On account of its temperate climate and fertile soil, the St. Lawrence valley region is well suited to agricultural and horticultural pursuits. The northern and sterile portion of the Laurentian region is covered with a dense forest, except in the extreme north, in what is known as the 'Great Barrens.' The great central plain, from a breadth of 800 miles at the international boundary, gradually contracts toward the north as a result of a western extension of the Laurentian region. Here we have the granary of the Dominion. In the extreme north it again increases in width, and along the banks of the rivers is heavily wooded. The general slope is from the southwest toward the east and north.

(3) A large part of Manitoba is the bed of a former lake, through which at the present time the Red River flows. It is very fertile. In the west of Manitoba the second prairie steppe begins, where the land is of a rather more undulating character than that to the east. Still farther west, a second steppe intervenes, followed in its turn by a third.





(4) The Cordilleran region, in British Columbia, attains a breadth of 400 miles, and is traversed from north to south by four ranges of mountains, including the partially submerged island range. Between the Gold and Coast Mountains is an elevated plateau region, in which is included the celebrated Okanagan Valley.

The highest peaks in Canada are Mount Logan (19,539 feet), and Mount Lucania (17,147 feet), in the Yukon District, and Mount Fairweather (15,292 feet), in British Columbia. The different ranges diminish in height as they approach the ocean.

Canada is drained by four river systems: (1) The Atlantic, including the St. John River in New Brunswick and the St. Lawrence River, with its tributaries—the St. Maurice, the St. Charles, the Saguenay, the Ottawa, and the Richelieu. The St. Lawrence River and the Great Lakes form a vast navigable waterway, extending from the Gulf of St. Lawrence into the heart of the continent. (2) The Hudson Bay system includes the Nelson, Albany, and Churchill Rivers, as well as the Saskatchewan, which, rising in the foothills of the Rockies, eventually discharges its waters into Hudson Bay through the Nelson. (3) The Athabasca and Peace Rivers flow into Lake Athabasca, which discharges its surplus waters into the Great Slave Lake, under the name of the Slave River. The Mackenzie River flows from the Great Slave Lake into the Arctic Ocean. These, with other rivers, are included in the Arctic system. (4) The Pacific system includes the Fraser, Thompson, and Columbia Rivers, all flowing into the Pacific Ocean.

Climate and Soil.—Along the Pacific Coast the Japanese current greatly modifies the extremes one would naturally look for in a continental province north of the forty-ninth parallel of north latitude. At Vancouver the mean temperature of the coldest month is 35.6° F., of the hottest 63.3° F., and in the winter the temperature seldom falls below 22° F. East of the Rocky Mountains we find such extremes of temperature as are generally to be expected in the same latitudes of the North Temperate zone.

In the northwest the chief disadvantage of the Canadian climate for wheat growing lies in the fact that there is an occasional early frost before harvest; but this risk is greatly minimized by the cultivation of the hardier varieties, which produce hard wheats (in particular Marquis wheat) unrivalled in the world for their excellent quality and high value. The summers, following the cold but invigorating winters, are bright and warm, and under the influence of the long, sunny days the wheat rapidly reaches maturity. In winter the cold of the districts adjacent to the mountains is mitigated frequently by the warm 'chinook' winds, which, especially in Alberta, soon clear the ground of snow and revive the pasture grasses.

In the east the presence of the Great Lakes and the adjacent ocean exercises a modifying influence upon the climate, while the winter's snow protects the ground from severe frosts. The presence of a cold Arctic current along the Atlantic Coast retards the advance of spring in the Maritime Provinces, where, however, there is a marked absence of those extremes both of heat and cold which are at times experienced farther west. The figures in the accompanying table give the mean annual temperature and average annual precipitation for representative centres throughout the Dominion.

Normal Mean Daily Temperature and Annual Precipitation

Place	Temperature, Fahr.	Precipitation, Inches
Halifax	44.3°	56
Charlottetown	41.8	39
St. John	41.6	48
Montreal	42.4	41
Toronto	44.4	33
Ottawa	41.8	33
Winnipeg	35.2	20
Regina	32.5	19
Edmonton	36.8	18
Vancouver	49.1	59

A large part of the Maritime Provinces has a climate and soil well adapted to raising all kinds of cereal, horticultural, and root crops. In Nova Scotia the most fertile parts are the Annapolis and Cornwallis valleys and the counties of Cumberland, Colchester, and Antigonish. In New Brunswick the valleys of the St. John and the Kennebecasis are the gardens of the province; while by far the larger part of Prince Edward Island is extremely fertile. In Quebec, the Eastern Townships and the valley of the St. Lawrence contain the best and most fertile land in the province. The peninsular part of Ontario is the most desirable portion of that province, from an agricultural and horticultural point of view. Peaches and grapes are grown there in large quantities. Farther west, in the Prairie Provinces, the virgin land is of unexcelled fertility; and this is true, to a less extent, as far north as the wooded portions of these provinces; while the Peace River country, in Northwestern Alberta, is particularly suitable for mixed farming. In British Columbia, the valleys in the interior and a large part of the sea coast are the choicest portions.

Geology.—Geologically, Canada may be divided into six great provinces. Of these, the most extensive is the great Laurentian Plateau. Its southern extremity includes a large part of Northern and Western Ontario, and even penetrates into the United States. On the east it follows the north bank of the St. Lawrence River in a northeasterly direction. Its western boundary runs toward the northwest until it is lost in the Northwest Territories. This great plateau is occupied by rocks of pre-Cambrian age, and belongs to the oldest of the world's systems of strata. To a certain extent this primeval area is enclosed and penetrated by granitic rocks. The Laurentian Plateau, particularly the northern part, is as yet largely unknown and unexplored; but since much of the southern portion has been discovered to be rich in valuable metals and minerals, it is highly probable that the more inaccessible parts may yet yield a rich return to the miner.

Surrounding the Laurentian Plateau are three geological provinces. In the extreme north lies the Arctic Archipelago, unknown and perhaps unknowable in its formidable armor of ice and snow. In the east is the St. Lawrence valley area, extending to and through the peninsular part of Ontario. In the west is the Interior Continental Plain, in many respects resembling the St. Lawrence valley. Both of these geological provinces are underlaid by sedimentary strata, deposited by the seas which encircled the Laurentian Plateau, or by the rivers and lakes which followed upon the oceanic period.

The Eastern or Appalachian area includes the Maritime Provinces and that part of Quebec which lies south of the St. Lawrence, while the Cordilleran area covers the province of British Columbia and part of the Yukon District. They have many characteristics in common, but the Cordilleran presents all the Appalachian peculiarities on a far grander and more imposing scale. Geologically, they are both of pre-Cambrian origin, and are marked by the presence of sedimentary strata and volcanic intrusions. Both areas are rich in the valuable minerals and metals.

Flora and Fauna.—The flora of Eastern Canada, embracing the Maritime Provinces, Quebec, and Ontario, is very much alike; but in certain respects the flora of Nova Scotia differs somewhat from that of the other provinces. In Nova Scotia a few varieties are found which are also common to Newfoundland, but do not exist farther west. On the other hand, Nova Scotia is lacking in a number of species which exist in New Brunswick, Quebec, and Ontario.

The southern flora is found to a certain extent as far north as the city of Quebec, but does not become distinctive until the latitude of Montreal is reached. Northern and Western Ontario,

SCENE IN THE ROCKY MOUNTAINS OF CANADA

The Beautiful Valley of the Bow (from the Banff Hotel).

on the other hand, belong rather to the northern type. The typical eastern flora continues for some distance into Manitoba, particularly in the river valleys and near the lakes, but is soon overwhelmed and obliterated by the prairie types, which in turn extend to the foothills of the Rockies. Farther north we reach the arctic regions of saxifrages, lichens, and mosses. In the prairies are found innumerable varieties of grasses, vetches, and wild peas. The flora of Western Alberta and British Columbia varies considerably, the variation depending upon altitude and the dryness or moisture, warmth or coldness of the climate. In Western British Columbia shrubs and wild flowers of all kinds flourish and bloom in profusion.

Moose and caribou are found in all the provinces save Prince Edward Island. Bears and wolves are found in much smaller numbers, and less widely scattered, though in constantly diminishing force they still lurk upon the outskirts of civilization. The prairie wolf or coyote, on the other hand, is confined to the Prairie Provinces. The musk-oxen are confined to the 'Great Barrens' northwest of Hudson Bay. In British Columbia the puma or cougar still roams. In all the provinces the fox, lynx, beaver, otter, marten, mink, skunk, and rabbit are found in varying numbers.

The Canada jay, grosbeak, wax-wing, and snow bunting remain during the winter; while in the southern latitudes the crow, blue-jay, chickadee, and other varieties are also winter birds. In summer numerous varieties of song birds are found everywhere. So also are geese, ducks, teal, partridges, and woodcocks, and in the prairies the so-called prairie chicken. In some parts the ducks remain all winter, as do the partridges, woodcocks, and prairie chickens. The sea birds include most of the common varieties, as well as a few peculiar to the country.

Forestry.—The forests of Canada contain pine, spruce, cedar, Douglas fir, and hemlock, elm, maple, beech, birch, butternut, hickory, basswood, and other less common varieties of trees. They are distributed very generally throughout the country, with the exception of the central prairie region, 32.5 per cent. of the total land area (or 1,151,454 square miles) being covered with forests, of which 311,234 square miles may be considered as containing saw-timber of merchantable size, while 554,641 square miles carry young growth which if protected from fire and other damage will eventually produce merchantable timber. The remaining 285,574 square miles are considered as inaccessible or unprofitable to operate under present conditions. The Pacific Coast as far north as Alaska is covered with an immense forest, the wooded area of British Columbia being estimated in 1926 at 91,432,100 acres, bearing 75,630 million cubic feet of merchantable conifers and 375 million cubic feet of broad-leaved varieties, besides much young growth. Large parts of the older provinces have been cleared for cultivation, but there still remain areas whose potential value is enormous, and these the Dominion and Provincial Governments are making praiseworthy attempts to protect. (See CONSERVATION MOVEMENT, *Canada*.)

The general policy of both the Dominion and the Provincial Governments has been to dispose of timber by means of licences to cut rather than to sell timber land outright. Of the 1,151,454 square miles of timber land, the area which is privately owned is 110,065 square miles, or only 9.6 per cent. of the total. Of the remaining 1,041,389 square miles owned by the State, 76,045 square miles is in forest reserves, 152,341 square miles is being cut under licences yielding revenue in stumpage bonuses, annual ground rents and royalties, while the remaining 882,048 square miles is unalienated.

In spite of the work of the Forestry Departments of the Federal and Provincial Governments, however, much remains to be done in surveying and tabulating the forest resources of the Dominion, in providing forest reserves, in preventing and stopping forest fires, and in replanting with suitable trees those areas which have been denuded and are unfit for cultivation, as well as providing trees for those sterile portions where trees have not grown naturally. In the Prairie Provinces, where the forests are under the control of the Dominion Government, these duties are now being undertaken by responsible officials, and in the older provinces a good beginning has been made. In Nova Scotia an attempt to classify and tabulate the merchantable timber and entire forested area has been attended with considerable success. Data on the forest resources of Saskatchewan have been collected, while a similar investigation is in progress in Ontario. Less comprehensive annual reports are issued by the Forest Service, Department of the Interior, Ottawa, and by the provincial departments administering timber lands in Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia.

The Dominion Government has established forest reserves in British Columbia (where the railway belt and a portion of the northeastern forest is under Federal control), Alberta, Saskatchewan, and Manitoba. These reserves cover an area of 34,171 square miles, are more or less protected by forest rangers, and are not open to settlement. By far the largest is the Rocky Mountain Reserve of 13,786 square miles, situated in Western Alberta. In British Columbia there are 14 reserves, in Saskatchewan 15, in Alberta 4, and in Manitoba 6. Portions of two of them have been set aside as a refuge for those indigenous wild animals which are neither dangerous nor harmful. Dominion parks in Alberta, Saskatchewan and British Columbia, with an aggregate area of 11,670 square miles, may also be considered as forest reserves. Besides these, the Provincial Governments of British Columbia, Ontario, and Quebec have set aside as forest reserves an aggregate area of 31,655 square miles, together with 11,928 square miles of provincial parks, making a grand total of 89,424 square miles reserved for timber production. (In this connection see also the sections on *Forestry* in the articles on the different provinces.)

There is no doubt that most of the forest fires, which in the five years 1922–26 destroyed an average of 1,392,000 acres per annum, are started by careless hunters or campers or by locomotives. Recent legislation makes the railways responsible for fires caused by locomotives. As a result of legislation initiated and urged by the Conservation Commission, the fire losses due to locomotives have been reduced to a minimum.

The necessity for forestation and reforestation has been urged upon both Dominion and Provincial Governments; but little has been accomplished, except in the Prairie Provinces, Ontario and Quebec, where the farmers are gratuitously provided with trees, the understanding being that they shall plant and care for them. The Dominion Government distributed some 7,500,000 young trees in the Prairie Provinces in 1927, and the Ontario Government distributed some 7,000,000 trees in that province. The capacity of the Quebec forest nursery has been raised to 10,000,000 trees.

Education in forestry and allied subjects and opportunities for research are offered by four Canadian universities and by other agencies. The University of Toronto, the University of New Brunswick at Fredericton, and the University of British

Columbia at Vancouver, provide four-year courses leading to a professional degree. The School of Forestry and Surveying in connection with Laval University at Quebec provides in the French language a combined course of four years' duration, leading to diplomas in both sciences. The Government of Quebec has established a school in paper making at Three Rivers in the heart of the paper industry; several agricultural colleges provide short courses in farm forestry, and a school for forest rangers has been established at Berthierville by the Quebec Forest Service.

The lumbering industry in Canada is a most important one. In 1926 the value of the lumber products, including the total value of the products of woods operations, together with the net value of production in saw mills and pulp mills, was $312,844,584. Among the natural industries it ranks second, coming next after agriculture. Canada is also an extensive producer of pulp wood, but lacks the valuable woods, save in British Columbia. The output of pulp wood in 1927 was valued at $70,284,895. Of the 114 pulp and paper mills operating in 1927, 50 are in Quebec, 44 in Ontario, and the rest in British Columbia, Nova Scotia, and New Brunswick. The pulp finds a ready market in the United States, but the Dominion and all the Provinces prohibit the exportation of pulp wood obtained from crown lands. The capital of the pulp and paper industry in 1927 was $579,853,552, and the products had a gross value of $219,329,753. The production of newsprint paper in 1927 was 2,082,830 tons, rising to 2,382,011 tons (provisional estimate) in 1928. Canada is the largest producer of newsprint paper in the world.

Fisheries.—Canadian fisheries, which are carried on over an area of 200,000 square miles in the Atlantic, 20,000 square miles in the Pacific, and 140,000 square miles of inland waters, are under the control of the Dominion Government, although each province has proprietary rights within its own jurisdiction. The ascertained value of the catch of sea fish for the calendar year 1927 was $41,921,126, and of inland fish $7,575,912—a total of $49,497,038, as compared with $56,360,633 in 1926. The fishing equipment was valued at $56,306,461, and the industry gave employment to 50,338 persons in sea fisheries, 13,077 in inland fisheries, and 16,697 in fish-canning and curing establishments—a total of 80,112. British Columbia and Nova Scotia are the leading fishing provinces.

The salmon, cod, lobster, and halibut fisheries are the most important, so far as value of catch is concerned. The industry is encouraged by the granting of liberal bounties by the Dominion Government. The interest on $4,420,882, the Canadian share of the fishery award granted in 1877 under the terms of the Treaty of Washington, is annually distributed among the deep-sea fishermen of the Atlantic Coast. Fishery inspectors have been appointed in the different provinces, and government boats patrol the fishing grounds for the purpose of enforcing the fishing regulations promulgated by the Government, and preventing poaching on the part of foreigners. (See FISHERIES.)

In order to increase the fish of all varieties, the Dominion Government has also established 32 fish hatcheries on the Atlantic Coast in the Prairie Provinces, and on the Pacific Coast, releasing in 1927 more than 295,000,000 fish eggs and fry in Canadian waters. Eight other hatcheries in Ontario, which distributed 454,500,000 fish eggs in 1926, were transferred to the Ontario Government in 1927. The Dominion Government has also equipped biological stations on the Atlantic, the Great Lakes, and the Pacific, where the habits of fish are studied and their treatment is considered.

A treaty was signed by Great Britain and the United States in 1908 for the purpose of providing uniform and effective regulations for the protection, preservation, and propagation of food fishes in waters contiguous to the international boundary between the United States and Canada. An International Fisheries Commission, composed of an American and a Canadian, was appointed in accordance with a provision of this treaty, for the purpose of preparing regulations in connection therewith.

The fishery clauses of the treaty of 1818 between Great Britain and the United States were referred to The Hague Tribunal for its decision with reference to the respective rights of the United States, Canada, and Newfoundland. In September, 1910, the decision of the tribunal was announced, and was received with satisfaction by all the interested parties. Previous to Dec. 31, 1923, United States fishing vessels were allowed, on payment of a fee of $1.50 per registered ton, to purchase provisions and outfits in Canadian ports, to transship catches and to ship crews, but these privileges have been discontinued, and United States fishing vessels are now limited to the provisions of the Treaty of 1818, under which they may call at Canadian ports only for shelter, wood, water or to make repairs.

The halibut fishery on the Pacific side is engaged in only from Canadian and United States ports, but owing to the fact that it is largely carried on beyond territorial waters, neither country alone can control it, but it is in the interests of both countries that the fishery should be permanently maintained in a flourishing condition. The question of dealing with the matter was referred to the Canadian-American Fisheries Conference appointed in 1918, and in 1922 Canada proposed that the halibut question should be considered by itself. This was agreed to, and resulted in the treaty signed March 2, 1923, 'For the Protection of the Pacific Halibut', which provides a close season for halibut fishing from Nov. 16 in each year to Feb. 15 following, both dates inclusive. This treaty was ratified on Oct. 21, 1924, and became effective Nov. 1, 1924.

Minerals.—All of the six geological provinces of Canada, with the exception of the Arctic region, contribute to the mineral production of the Dominion. The Appalachian region, comprising the Maritime Provinces and that part of the province of Quebec which lies south of the St. Lawrence, was responsible in 1928 for about 18 per cent. in value of the total production. In this area coal is by far the most important non-metallic mineral, and at present the larger part of it is mined in Cape Breton Island and the northwestern portion of the peninsula of Nova Scotia. Next comes asbestos, found in the Eastern Townships of Quebec. Gypsum occurs in many places in the Maritime Provinces, and gold and copper are produced.

The St. Lawrence region, lying west and southwest of the Appalachian, is not rich in minerals, being largely an area of sedimentary deposits. In that portion of it commonly known as the peninsular part of Ontario, petroleum and natural gas are present in large quantities. Gypsum also is mined to some extent. From this region is produced about 2½ per cent. of the mineral output of Canada as measured by value.

The southern part of the Laurentian region was credited in 1928 with 40 per cent., in value, of Canadian mineral products. Gold came first, the richest gold mines being in the Porcupine district of Northern Ontario and the near-by Rouyn district of Quebec. The Hollinger mine, in particular, is credited with having been the most productive individual gold mine in the world. Silver came next, the richest mines being situated in the famous Cobalt district of Northern Ontario. West of Cobalt and north of Lake Superior is another well known silver-producing area. Large and productive nickel mines, which produced nickel valued at $22,318,907 in 1928, are found near Sudbury. This is also a famous copper-producing district. Iron ore is found in that part of Ontario which lies north of Lake Superior, but is of too low grade to be profitably refined under present conditions.

The interior Prairie region closely resembles the St. Lawrence region both in its geological formation and the minerals it contains. This is subject, however, to one important exception, for the Prairie region contains large deposits of coal and lignite, whereas the St. Lawrence region lacks both. In the Prairie, as in the St. Lawrence region, petroleum, natural gas, and gypsum are present in large quantities. This region produces 2½ per cent. in value of the minerals of the Dominion.

The Cordilleran region, embracing Western Alberta and all of British Columbia, supplies about 36 per cent., in value, of Canada's minerals. Coal is the most important of these. Its output in 1928 was about 10,140,000 tons as compared with 6,741,000 tons in Nova Scotia. Besides, its value is proportionately greater, as the price is higher in the west than in the east. The richest gold and copper areas are situated at and near Rossland. The ore is a combination of gold and copper. The silver-lead ores are found in the southeastern part of British Columbia.

During the last twenty years the mineral output of Canadian mines has increased three times in value, but as yet only the fringe of the Dominion has been thoroughly investigated, so far as its mineral possibilities are concerned, and it is probable that there are valuable mineral resources still undiscovered. Among the latest discoveries are those of gold and copper in the Rouyn district in Northern Quebec, of gold in the Red Lake district of Ontario and of copper in the Flin Flon area on the border between Manitoba and Saskatchewan.

The total value of all minerals produced in Canada during the year 1928 is provisionally stated as $273,446,864, an increase of $101,000,000 over 1921 and the largest value on record. The following table lists the most important minerals produced in 1928 with their valuation.

Mineral Production, 1928

Mineral	Value
Coal	$62,681,136
Silver	12,753,806
Nickel	22,318,907
Copper	28,488,118
Gold	39,091,472
Asbestos	11,238,360
Lead	15,474,003
Zinc	10,250,589

The mining industry in Canada represents a capital investment of more than $700,000,000 actually spent on the properties or used as working capital by the operating companies. Approximately 85,000 persons were employed in 1927.

(See CONSERVATION MOVEMENT, *Canada.*)

Agriculture. — Agriculture is the leading industry in Canada, not only in the Prairie Provinces of the middle west, but also in the older provinces of the east; while the value of the agricultural products is greater than of any other industry, excepting the net product of manufactured commodities. In a general way the agricultural belt extends across the continent north of the American border, a belt 2,500 miles long and several hundred miles wide, but not all of this vast area is suitable for cultivation. In Western Ontario, for instance, is an immense area of land north of Lakes Superior and Huron which will probably always be forested country. A large part of Quebec north of the St. Lawrence will perhaps never be cultivated, and the same is true of large areas in the Maritime Provinces, with the exception of Prince Edward Island. In British Columbia, too, the fertile land is confined to the valleys. The land of agricultural value in Canada, under existing conditions, has been estimated in the final report of the Dominions Royal Commission at 689,062 square miles, an area subject to increase as new early-maturing and frost-resisting varieties of grains and other field crops are evolved.

In the Prairie Provinces land is still to be obtained free in quarter sections of 160 acres each; but the holder must perform certain services entailing actual occupation and cultivation for part of each year. In these provinces the public lands are still (1929) under the ownership and control of the Dominion Government, though negotiations are going on for their transfer to the provinces. In the older provinces there are many vacant farms which can be obtained for nominal sums, while the Crown lands are also disposed of upon easy terms to actual settlers. The government of New Brunswick has undertaken the purchase of vacant farm lands which it is selling to immigrants. In the Prairie Provinces the Canadian Pacific Railway owns several millions of acres of land which are for sale to settlers. Portions of this land have been brought under partial cultivation by the company, and buildings erected. These are sold to settlers as 'ready-made' farms, and payments are accepted on the installment plan. The company has also constructed extensive irrigation works in those districts where the rainfall is insufficient. The Hudson's Bay Company has considerable areas of land for sale in this part of Canada. (See the sections on *Conservation* and *Irrigation* in this article.)

Though an increasing tendency toward mixed farming is observable in Manitoba, the farmers of the Prairie Provinces still devote most of their attention to the growth of wheat. In the Eastern Provinces the farmers have adopted mixed farming, and wheat is becoming a crop of comparatively little importance. In general, however, the average eastern farmer uses no system of rotation of crops, or the system adopted by him does not answer the purpose; while in the west wheat growing has been aptly described as 'wheat mining.'

Horticulture is successfully practised in many parts of the Dominion. In the Maritime Provinces the greatest progress and most successful results have been obtained in the fertile Annapolis valley in Nova Scotia, in parts of Prince Edward Island, and in the St. John valley in New Brunswick. In Quebec, portions of the Eastern Townships and the Island of Montreal grow the largest amount of fruit; but the peninsular part of Ontario is the real fruit centre of the Dominion. There apples, pears, plums, peaches, grapes, and berries are grown to perfection. In British Columbia several of the fertile valleys of that province have established a world wide reputation for the size and color of their apples. The commercial value of the fruit-growing industry in Canada was estimated at $17,605,995 in 1927, while the grand total value of fruits produced would approximate $25,000,000.

Dairy Farming is carried on in all parts of the Dominion, and Canadian cheese, made to a large extent in coöperative factories, has attained an excellent reputation in the English market. The best known cheeses are produced in the Eastern townships of Quebec and in Ontario. Formerly butter also was exported to Great Britain, but this trade has ceased, owing partly to the increased demand at home, and partly to the excellent prices obtained for milk and cream. The value of the total production of milk and its products is estimated for 1927 at $253,736,605, as compared with $288,836,093 in 1920. The 1927 figures include creamery butter $65,709,986, dairy or home-made butter $30,435,121, factory cheese $25,522,148, home-made cheese $70,654, miscellaneous dairy factory products $18,879,335 and milk consumed fresh $113,119,361. Both the Dominion and the Provincial Governments, which under the Canadian constitution have joint jurisdiction in agricultural matters, encourage the development of agriculture and its allied industries by the publication of information, gifts of seeds to farmers, the maintenance of experimental stations where research work is carried on, and the publication of the information thus obtained.

In 1928 there were twenty-seven experimental farms in Canada, scattered from the Atlantic to the Pacific, maintained by the Dominion Government. In addition, experimental work was carried on in nine different places in the more northerly parts of the Prairie Provinces. These sub-stations are largely for the purpose of determining the varieties of crops that may be successfully grown in high latitudes. Several of the provinces also maintain agricultural schools or colleges with experimental farms attached, the most notable being the Nova Scotia College of Agriculture, Macdonald College at Ste. Anne de Bellevue, Quebec, and the Ontario Agricultural College at Guelph. (See AGRICULTURAL EDUCATION.)

Chief Canadian Crops in 1928

	Bushels	Value at point of production
Wheat	533,572,000	$426,013,000
Oats	452,163,000	210,956,000
Barley	136,391,000	76,112,000
Rye	14,618,000	11,491,000
Buckwheat	10,899,300	10,128,000
Flaxseed	3,614,000	5,758,000
Corn for husking	5,241,000	5,860,000
Potatoes	83,658,000	40,874,000
Turnips, etc.	72,705,000	20,700,000
Hay and clover	*16,515,000	171,225,000
Fodder corn	*3,666,400	17,204,000

*Tons.

In 1928 the estimated total area under field crops was 59,351,811 acres. While the yields of wheat and barley were the largest on record, and the yield of oats was the largest since 1923, the hay and clover crop was smaller than in 1927. Owing to lower prices, the total value of the field crops at point of production was only $1,099,781,000 as compared with $1,172,643,600 in 1927. The yields and values of the most important varieties are given in the accompanying table.

Conservation.—The Canadian Conservation Commission, composed in part of certain Federal and Provincial ministers whose interests were closely connected with the natural resources of the country, and in part of professional and business men to whom the conservation of the wealth of the country was a matter of importance, financial or otherwise, was established in 1909 by the Dominion Government. It was discontinued in 1921 since as a result of its investigations and advice various governmental organizations, such as the Department of Public Health, the Forestry Branch, the Water Powers Branch, the Lands Branch, and the Natural Resources Intelligence Branch of the Department of the Interior, were organized to carry out its recommendations. The annual and special reports of the Commission, however, remain as a most valuable library of information on the many subjects with which they deal.

Irrigation in Canada is as yet confined to small areas in the southern parts of Saskatchewan and Alberta, in which provinces the work is under the supervision of the Dominion Government. In 1919 it was decided between the Dominion and the Alberta governments that the former would continue to make surveys and exercise supervision, but would not assume responsibility for actual irrigation developments. The Alberta and Saskatchewan governments in 1920 passed Irrigation District Acts which made it easy for settlers in an area to organize and proceed with the necessary developments. Dry seasons have increased public interest in irrigation, but the declining prices of agricultural products and the high rates of interest have been a stumbling-block. The irrigation officials, who are appointed by the Dominion Government, have their headquarters in Calgary, Alberta, and nearly all of their work is in the southern part of the Province of Alberta, where irrigation is more necessary than in the adjoining Province of Saskatchewan. The Canadian Pacific Railway Company has been drawing its supply mainly from the Bow River, and at the present time has water sufficient to supply the needs of 2,000,000 acres of irrigable land, while the irrigable area is 727,000 acres, reached by 4,162 miles of canals. Its irrigation enterprise in the Lethbridge district supplies 108,000 acres from St. Mary's river. The Alberta Railway and Irrigation Company has been granted supplies from the Belly, Milk, and St. Mary Rivers. The Southern Alberta Land Company obtains water from the Bow and South Saskatchewan Rivers for 530,000 acres; and its subsidiary company, the Alberta Land Company, has been granted the supply of a small amount from the Bow River.

Stock Raising.—The distinctive ranching country of Canada is in Southern Alberta and Southwestern Saskatchewan, where 6,247,700 acres of land were under grazing leases in 1928. The Peace River district and certain parts of Manitoba also have ranching areas. The ranches, however, have largely been displaced by farms, and the raising of live stock has taken its proper place as part of the general farming system. Thus the type of live stock farming varies greatly in the different districts of Canada. Dairy farming is typical of Eastern Canada since this region is tributary to the populous Canadian and American centres demanding milk and cream and convenient to the overseas markets for cheese and butter. The demands of the American Middle West for cattle and of the Pacific Coast for hogs have influenced the kind of live stock production in the West.

The live stock industry of Canada is characterized by periods of depression and prosperity due to changing markets. It is profoundly influenced by the height and variation of United States tariffs and their changing effectiveness with price changes. It also encounters climatic difficulties, centred around the cold winter and short pasturage season. Other farm enterprises, particularly in the agricultural west, have greater comparative advantages, but live stock raising has shown evident, though intermittent growth. In recent years there has been a great improvement in the class of stock kept on Canadian farms, as is shown by the statistics of pure bred stock collected at the census.

The Dominion Government is now directing the attention of farmers in various parts of Canada to the increased demand for mutton and wool. The Maritime Provinces and parts of British Columbia are well adapted to sheep raising. Good land for the purpose can be obtained at a nominal sum, and there is no doubt that for the average farmer a small flock of sheep is a desirable investment. In the Prairie Provinces the cold winter, the expense of fencing, and the loss from prairie wolves must be considered by the prospective sheep breeder. The numbers of the different varieties of live stock in Canada in 1921 and 1928 are shown herewith.

Canadian Live Stock, 1921, 1928

	1921	1928
Horses . .	3,813,921	3,376,394
Milch cows .	3,736,832	3,792,522
Other cattle	6,469,373	5,000,750
Sheep . .	3,675,860	3,415,788
Swine . .	3,904,895	4,497,367

Shipping.—In the days of wooden sailing vessels, Canada held an important position among the maritime nations of the world. The highest point was attained in 1878, when there were 1,333,015 tons of shipping on her registry books. Since that time there has been a decrease, the tonnage of new vessels per annum falling as low as 16,146 in 1896. At the present time, the amount of tonnage owned is relatively so small, compared with former years, that Canada has been reduced from fourth to ninth place. But her maritime population still preserves the seafaring instinct, and efforts are now being made to encourage the building of steel steamers. There are shipyards at Collingwood, Port Arthur, and other places, where steel vessels are built for lake traffic, while successful experiments have been made along the same lines in Nova Scotia and British Columbia. The Dominion Government maintains a shipyard in Sorel, where scows, dredges, and small steamers are constructed. The vessels built and registered in Canada in the fiscal years ended 1926 and 1927 had a tonnage of 39,840 and 32,801 tons respectively.

On Dec. 31, 1927, the total number of vessels on the registry books of the Dominion was 8,454, of 1,956,268 gross and 1,368,000 net tons. The new vessels built and registered during the year numbered 398, of 32,237 gross and 21,943 net tons. The number of vessels having Canadian registration included 5,096 steamers, with a gross tonnage of 1,428,024. The number of men and boys employed on Canadian vessels in 1927 was 42,410. Nova Scotia formerly had the largest registered tonnage of any Canadian province, but at present, Quebec, Ontario, and British Columbia take precedence in the order named.

The tonnage of seagoing vessels other than coasting vessels which arrived during the fiscal year 1927–28 was 24,240,847; the tonnage of those which departed was 23,973,787. Vessels employed in inland waters between Canada and the United States had an arrival tonnage of 16,745,632, and a departure tonnage of 18,843,531. Vessels employed in the coasting trade showed an arrival tonnage of 45,381,586 and a departure tonnage of 44,146,030.

Canals.—The canals of the Dominion of Canada, which played an important part in the early settlement of Ontario and still have an important place in the transportation system of the country, are owned and operated by the Dominion Government. According to their geographical position, they naturally comprise six main systems:

(1) The first and most important is that which has been constructed primarily for the purpose of affording a navigable water route between Lake Superior and Montreal, at the head of ocean navigation. This series of canals has a total length of 74 miles, and comprises from west to east the following, in the order named: The Sault Ste. Marie, between Lake Superior and Lake Huron (dimension of lock, 900 x 60 feet; depth of water at lowest known water level, 20¼ feet); the Welland Canal, between Lakes Erie and Ontario (a new Welland canal 25 miles long, with 7 lift locks, each 800 feet long by 80 feet wide, and having a lift of 46½ feet and a depth of 30 feet on the sills, now under construction), and the Murray, Galops, Rapide Plat, Farran's Point, Cornwall, Soulanges, and Lachine Canals. The total lockage is 551 feet, and the number of locks through which a vessel passes from Port Arthur or Fort William, at the head of Lake Superior, to Montreal is 48. The Soulanges is now used instead of the Beauharnois Canal, the latter having been abandoned as a means of navigation. The enlargement of the canals between Lake Erie and Montreal has resulted in the erection of locks of the minimum dimensions of 270 x 45 feet, with a minimum depth of water on the sills of 14 feet. On the Sault Ste. Marie Canal the total movement of freight in 1928 was 2,007,137 tons, an increase of 536,586 tons as compared with the preceding year. On the St. Lawrence River canals the tonnage was 8,411,542, an increase of 498,590 tons. The quantity of wheat which passed down the St. Lawrence River canals in 1928 was 3,833,778 tons, as compared with 3,573,341 tons for the preceding year.

(2) The second system comprises the Grenville, Carillon, and Ste. Anne's canals, having a combined length of 7 miles, and affording, in conjunction with the Ottawa River, a means of water transportation between the city of Ottawa and the St. Lawrence River. The minimum lockage dimensions are 200 x 45 feet, with a depth of 9 feet on the sills.

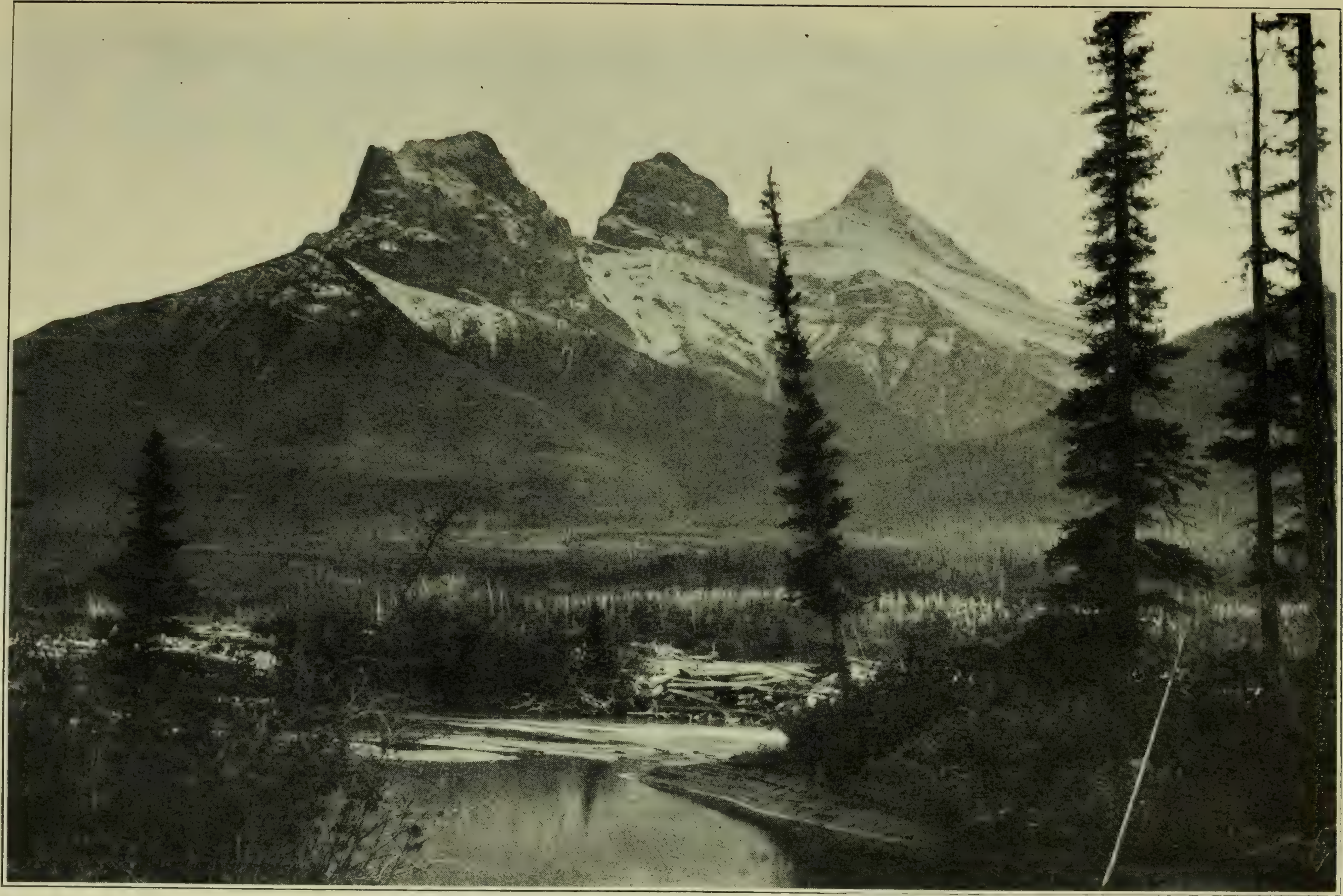
(3) The third system comprises the Chambly and St. Ours' canals, which make it possible for boats to pass from Sorel, at the mouth of the Richelieu River, to Lake Champlain. These canals have a combined length of 13 miles, locks with minimum dimensions of 118 x 22½ feet, and a depth of water on the sills of 7 feet.

(4) The fourth series of canals is included in what is known as the Rideau Navigation System, which connects the Ottawa River at the city of Ottawa with the eastern end of Lake Ontario at Kingston, a distance of 126 miles, a large part of which is a river waterway. The minimum lock dimensions are 134 x 33 feet; depth of water on the sills, 5 feet; total lockage, 457 feet, rise and fall. The Perth branch of this system connects Beveridge's Bay, on Lake Rideau, and the town of Perth.

(5) The fifth system (the Trent Canal) is not yet completed. It is composed of a chain of rivers and lakes extending from Trenton, at the mouth of the Trent River, on the Bay of Quinté, Lake Ontario, to Lake Huron, a distance of about 236 miles, of which about 20 miles will be canals. The navigable portion of this system extends from Trenton to Washago, a distance of about 200 miles. It is noted for the hydraulic lift-lock at Peterborough, which is capable of lifting an 800-ton vessel a vertical distance of 65 feet.

(6) St. Peter's Canal, forming the sixth system, connects St. Peter's Bay, on the south side of Cape Breton Island, Nova Scotia, with the Bras d'Or Lake. It is nearly half a mile long, with lockage dimensions of 300 x 48 feet, and a depth of water on the sills of 18 feet.

Portions of the St. Lawrence River below Montreal may be considered a submerged canal. By means of an extensive and



SCENE IN THE ROCKY MOUNTAINS IN CANADA

The Three Sisters, Canmore, Alberta.

costly system of dredging, a minimum depth of 30 feet has been obtained. The dredged channel has a minimum width of 450 feet, extending to 700 feet at points of curvature. It is well lighted and buoyed.

The total capital expenditure for canals by the Canadian Government up to March 31, 1928, has been $203,420,904, of which $90,301,957 had been expended upon the New Welland Ship Canal. The total revenue for the fiscal year 1927–28 from rentals, wharfage, dues, fines, etc., was $1,355,677. No tolls are extracted on any of the canals. The traffic passing through all the canals during the season of 1928 amounted to 18,720,441 tons, an increase of 1,232,130 over the tonnage for the preceding year and nearly double the tonnage of 1921.

Georgian Bay System.—The construction of a new canal system for the purpose of providing a shorter water route between the Great Lakes and Montreal was some years ago strongly urged, but is no longer regarded as practical, in view of the greater interest in the St. Lawrence and the approaching completion of the Welland Ship Canal.

A counter proposition, a part of which is in actual process of completion, is to provide a 25 or 30-foot channel from Lake Erie to Montreal, and the work of constructing the new Welland Ship Canal is now in its later stages, $90,301,957 having been spent on the new Welland up to March, 1928. The locks on the new canal will be 800 feet long and 80 feet wide, and will provide 30 feet of water over the mitre sills. It is expected that the work will be complete in 1930, opening Lake Ontario to the grain carriers of the Upper Lakes. A $4,000,000 grain elevator and other works are under construction at Prescott, at the head of the St. Lawrence rapids in anticipation of the opening of the canal.

The larger part of the work, however, will be the deepening of the St. Lawrence canals, which may be eventually undertaken in connection with the development of hydro-electric power at the St. Lawrence rapids. A report submitted in 1921 to the International Joint Commission by an eminent American and an eminent Candian engineer is to the effect that a 25-foot channel can be provided from Lake Ontario to Montreal for $252,728,200, or a 30-foot channel for an additional $17,986,180, besides developing for the use of the two nations the 1,464,000 estimated horse power available at the Long Sault Rapids.

It would appear, therefore, in view of the enormous wealth and resources of the regions bordering upon the Great Lakes in the United States and Canada that, if an equitable division of the cost and of the advantages can be arranged between the two countries, the construction of the 30-foot channel through the Great Lakes will mean much more to the economic development of the North American continent than could the Georgian Bay Canal, of which comparatively little is now heard. The new Beauharnois canal, construction of which was begun in the summer of 1929, will provide a canal 800 feet at the top, 600 feet at the bottom, and 27 feet of minimum depth from Lake St. Francis to Lake St. Peter in the all-Canadian section of the St. Lawrence River, incidentally developing some 500,000 additional horse power. The enterprise will involve an estimated cost of $16,000,000 to the Beauharnois Light, Heat and Power Co. for the canal and of $21,600,000 to the Government for navigation facilities.

Railways.—When the Maritime Provinces entered the Confederation, it was agreed that a railway should be built to connect them with Quebec, a promise which was redeemed by the completion in 1876 of the Intercolonial Railway, which is owned and operated by the Dominion Government. Later, the Canadian Pacific Railway Company was incorporated for the purpose of affording a connection between British Columbia and the Eastern provinces. At the present time, the Intercolonial, Transcontinental, Canadian Northern, National Grand Trunk, Grand Trunk Pacific and Prince Edward Island Railways are owned and operated by the Dominion Government, under the general name of the Canadian National Railways. The Canadian National Railways Board was operating on Dec. 31, 1928, 22,468,49 miles of lines, including 3,104,36 miles of the Eastern lines in the Maritime Provinces and Eastern Quebec. For these lines separate records are maintained. Ontario and New Brunswick also maintain railways under provincial government management.

In December, 1927, there were 40,572 miles of railway in operation in Canada, which has the largest per capita mileage of any country in the world. This is an increase of 219 miles as compared with the preceding year. Including the Government railways the total capital was $3,637,837,497, about three-eighths stocks and five-eighths bonds, an increase over the preceding year of $76,888,565. The cost of the Government lines was $502,370,886 to March 31, 1928.

Canadian Pacific System.—The Canadian Pacific Railway Company, the first to be constructed of the three great Canadian railway systems which now connect the Atlantic with the Pacific Ocean, owns and operates more than one-third of the railway mileage of Canada. Among the many improvements planned and completed by this company in the comparatively prosperous years from 1912 to 1917 were the double tracking of its line between Fort William and Hargrave, west of Brandon, between Broadview and Swift Current, and between Montreal and Perth, to be extended to Toronto. The company, during its more prosperous period, also built a double-track bridge across the St. Lawrence near Montreal to replace the old bridge, and placed two new boats on its Vancouver-Japan-China service. The company also owns a large fleet of steamers by means of which communication is maintained between Montreal and Europe, and between Vancouver and the Orient, and has several ships engaged in the coasting trade on the Pacific, as well as on the Great Lakes during the navigation season.

The operating revenues of the Canadian Pacific railway in 1928 were $230,406,354 and the operating expenses $173,871,973, leaving an operating income of $51,694,452.

National Transcontinental Railway.—In 1903 the Dominion Government entered into a contract with the Grand Trunk Railway Company for the construction of a railway from Prince Rupert, on the Pacific Coast, to Moncton, in New Brunswick. The portion from Prince Rupert to Winnipeg was to be built and operated by the Grand Trunk Railway Company, and was to be known as the Grand Trunk Pacific Railway. The part from Winnipeg to Moncton was to be constructed by the Government and leased to the Grand Trunk Pacific Railway for operation. This eastern portion—the National Transcontinental Railway—has been completed from Winnipeg to Moncton, a distance of 2,007 miles. The cost of construction — $156,701,210 — was greatly in excess of the amount anticipated by the Government or by the Grand Trunk Pacific Railway, which had agreed to operate it and pay a rental of 3 per cent. on cost. In addition, the Grand Trunk Pacific Railway became financially embarrassed and was quite unable to assume the responsibility of providing the necessary rolling stock and meeting the anticipated operating deficits. A government commission, appointed for the purpose of investigating the manner in which the railway had been constructed, reported adversely, and as a result the Grand Trunk Railway Company declined to be bound by its contract, and the Government was compelled to operate the line. The great railway bridge over the St. Lawrence near Quebec City was successfully completed in 1917. The National Transcontinental has been of considerable value as a colonization road in Northern Ontario and Quebec, and is now being operated as a part of the Canadian National Railways.

The Grand Trunk Pacific Railway was controlled by the Grand Trunk Railway, which held nearly all the common stock and, together with the Dominion Government, guaranteed the bonds of the Grand Trunk Pacific. It has been fully completed and is being operated between Winnipeg and Prince Rupert. The gross receipts were quite insufficient to meet operating expenses and fixed charges, nor was the parent company, the Grand Trunk Railway, able to meet the recurring deficits, with the result that the Dominion Government was called upon more than once to make good the deficiencies. In 1916, after the Dominion Government had made loans to the Grand Trunk Pacific and the Canadian Northern Railway Company, a royal commission was appointed to investigate the general problem of transportation, the status of each of the three transcontinental systems and the reorganization of any of these systems or their acquisition by the Government. This commission, composed of Alfred Holland Smith of New York, Sir Henry Drayton of Ottawa, and William M. Acworth of London, England, presented a majority report signed by the two latter, recommending that in view of the existing situation the public should take control of the Grand Trunk Pacific, the Grand Trunk proper, and the Canadian Northern, these to be consolidated and administered on purely business principles by a Board of Trustees, such compensation as seemed proper to be decided by arbitration and given to the shareholders of the Grand Trunk and the Canadian Northern. This report, generally known as the Drayton-Acworth report, has become the basis of the subsequent railway policy of the Canadian Government. The Grand Trunk Pacific was taken over by the Government under receivership on Mar. 10, 1919, and has been operated as a part of the Canadian National Railways since October, 1920.

The *Grand Trunk Railway* is the oldest of all the great Canadian railway systems. It was chartered in 1852, and was financed by English capital. As its name implies, it was intended to furnish a trunk line to connect the British-American provinces in existence at the date of its incorporation. In this it was supplanted by the Intercolonial Railway, so far as the Maritime Provinces were concerned. Its main line runs between Portland (Maine), Montreal, and Chicago, with numerous branches in Ontario. As a result of its unfortunate entanglement with the Grand Trunk Pacific and of the financial difficulties consequent upon its war-time operation, the Grand Trunk Railway was taken over by the Canadian Government, the question of the amount to be paid for it having been referred to the Imperial Privy Council in consequence of the disagreement of the three arbitrators. This final decision was against the dissatisfied shareholders of the Grand Trunk, who, however, received a guarantee of interest payments on their guaranteed and debenture stocks to a total amount of $216,207,142. The Grand Trunk is now included in the Canadian National system.

The *Canadian Northern Railway*, Canada's third transcontinental line, completed its system from ocean to ocean, and operated trains between Quebec and Montreal in the East, and Winnipeg, Edmonton, and Vancouver in the West. In addition it controlled two railways in Nova Scotia. For some years it often appealed successfully to the Dominion Government for help and as in the case of the Grand Trunk Pacific, both the Dominion and Provincial Governments became heavily involved by guarantees of interest on the bonds of the railway. Finally a commission appointed by the Government to inquire into the railway situation in Canada and advise what remedy should be adopted, recommended in its majority report that the Canadian Northern, the Grand Trunk, the Grand Trunk Pacific, and the Government Railways should all be transferred to a Board of Trustees appointed by the Government, but freed from political influence. The third member of the commission, the president of the New York Central, advised that government ownership and operation should not be adopted, but that a readjustment of existing lines should be tried. The Government eventually adopted the majority suggestion, and passed an act bringing the Canadian Northern Railway under public ownership and operation. This was accomplished by the acquisition of the remaining 600,000 shares of common stock of the company, as the Government already owned the remaining 400,000 shares. The Canadian Northern was subsequently incorporated with the Canadian National system.

Hudson Bay Route.—The Canadian Government some years ago undertook to build a railway from Le Pas Mission (on the Canadian National Railway) to Port Nelson on Hudson Bay. During the war and for some years afterwards the project was suspended, but construction was resumed in 1926, with Fort Churchill instead of Port Nelson as the terminus. The tracks have now been laid to Fort Churchill.

See also RAILROADS, *Canada*.

Postal, Telegraph, and Telephone Service.—During the fiscal year ending March 31, 1928, the Canadian postal revenue was $30,529,155 and the expenditure $32,379,196. This expenditure does not include the cost of post office buildings, as these are constructed by the Department of Public Works. On Mar. 31, 1928, there were 12,478 post offices in the country compared with 12,440 in 1920, the comparatively small increase in the number during recent years being due to the extension of rural mail delivery. The number of money orders issued in Canada in the fiscal year ended March 31, 1928, was 17,505,563, having a value of $200,773,403. Two-cent letter postage, which had been abandoned during the war, again became effective for Canada, the United States, Newfoundland and other countries of North America on July 1, 1926, and for Great Britain and the British Empire on Dec. 25, 1928. Air mail services are being instituted, and a parcel post service and a rural mail delivery have been established. In connection with the post office, a post office savings bank is operated, with deposits which at the end of February, 1929, aggregated $25,080,704.

At the end of 1927 there were six telegraph companies doing business in Canada, in addition to the service maintained by the Dominion Government on the north shore of the St. Lawrence and extending into Labrador, also in the outlying points of the Maritime Provinces and British Columbia. There were also six transoceanic cables having a terminus in Canada. The telegraph companies reported for 1927 a revenue of $12,990,549, operating expenses of $10,600,412, wire mileage of 323,539 and pole line mileage of 52,731 miles. The number of messages sent was 15,564,067, the number of cablegrams 6,664,771, including transatlantic cablegrams relayed between Canso, N. S., and the United States. The Marconi Company, in conjunction with the Government, has established land stations from the Atlantic Coast to Ontario. A wireless service to the United Kingdom is also maintained by the Marconi Company. The most important telegraph companies are the Canadian National Telegraph Company (formerly the Great Northwestern), the Canadian Pacific, and the Western Union.

In 1927 there were 2,462 telephone companies or organizations in Canada, but many of these are only local in their field of operations. They include provincial government, municipal, stock, coöperative, partnership, and private organizations. By far the most important is the Bell Telephone Company. The Prairie Provinces of Manitoba, Saskatchewan, and Alberta have bought up the plant of the Bell Company within these provinces, and are actively engaged in constructing trunk lines and aiding the rural communities to connect with them. Many cities and municipalities have also established systems of their own. (See MANITOBA; SASKATCHEWAN; ALBERTA.) The capital of all the telephone organizations in 1927 was $192,442,495; gross earnings, $56,907,338; operating expenses, $48,561,916; net earnings, $8,345,422. The wire mileage was 3,591,035; number of telephones, 1,259,987; and number of employees, 23,437, receiving salaries or wages to the amount of $26,254,605. There was a telephone instrument for every 7.6 persons in the country.

Water Powers.—One of the most important undertakings in the recent history of Canada is the remarkable development of its water powers, which is proceeding rapidly and affecting the industrial situation, particularly in the pulp and paper industry. In the past it has been a drawback to the industrial provinces of Ontario and Quebec that most of their manufacturing was dependent upon the use of United States coal. The utilization of the 'white coal' of the great rivers of Canada is taking away this disadvantage. The turbine installation in Canada has increased from 235,946 h.p. in 1901 to 5,349,232 in 1928. Of the latter figure, 2,387,118 h.p. are developed in Quebec and 1,903,705 in Ontario. It is officially estimated that only one-eighth of the available water power is as yet in use, and in electrical energy generated per head of population Canada ranks second only to Norway.

Manufactures. — Manufacturing in Canada is increasing at a rapid rate. The growth and prosperity of the agricultural population, especially in the West, have created an extensive market for the products of the factories. The capital and energy of Eastern Canada, particularly Ontario, are largely devoted to meeting this increasing demand for manufactured goods. Added to this is the fact that the home producer enjoys a large measure of protection from British and foreign competition by means of the tariff. The hemp and copper industries are also encouraged by liberal bounties. (See TARIFFS.)

In 1900 the principal statistics of manufactures, as shown by the census of 1901, were as follows:

Establishments	14,650
Capital	$446,916,487
Salaried employees	30,691
Salaries	$23,676,146
Wage earners	308,482
Wages	$89,573,204
Raw and partly manufactured materials	$266,527,858
Products	$481,053,375

The following table gives the corresponding statistics for 1910, as shown by the census of 1911:

Establishments	19,218
Capital	$1,247,583,609
Salaried employees	44,077
Salaries	$43,779,715
Wage earners	471,126
Wages	$197,228,701
Raw and partly manufactured materials	$601,509,018
Products	$1,165,975,639

As a result of the conviction that a period of ten years—during which no records are collected—is unduly long, the Department of Trade and Commerce in 1905 instituted the custom of compiling a series of figures midway between the regular census years. This is called the Postal Census and was taken in 1905 and 1915 for all establishments having an output of $2,500 or over, irrespective of the number of persons employed, except in the case of flour and grist mills, butter and cheese factories, fish preserving factories, saw-mills, brick and tile yards, lime kilns and electric light plants, where all plants were included.

An annual census of industry was established in 1917, when all establishments reporting to the Bureau of Statistics were included, the result being a large increase in the number of establishments, from 21,306 in 1915 to 34,392 in 1917, 35,797 in 1918 and 38,344 in 1919. However, on account of the smallness of the establishments on the custom and repair group, this whole group was dropped from the annual census after 1921, while the construction industries are also not included in the total. The gross production of Canadian manufacturing industries, with these exceptions, has increased in the last few years from $2,482,209,130 in 1922 to $3,425,498,540 in 1927, or by over $943,000,000.

The manufactures for 1927, classified by industries, are given in the accompanying table.

Statistics of Manufactures by Groups of Industries for 1927

	Establishments	Capital	Employees	Salaries and Wages	Cost of Materials	Net Value of Products	Gross Value of Products
		$		$	$	$	$
Vegetable products	4,793	494,176,054	78,300	81,830,734	429,325,105	283,374,975	712,700,080
Animal products	4,692	233,113,872	68,381	61,407,018	325,455,482	132.260,556	457,716,038
Textile products	1,802	346,512,165	107,519	95,891,243	198,870,157	183,137,300	382,007,457
Wood and paper	6,811	1,023,301,749	150,550	167,995,734	271,780,232	357,786,924	629.567,156
Iron and its products	1,148	638,914,893	106,293	143,351,174	261,102,679	264,819,160	525,921,839
Non-ferrous metals	401	208,957,166	33,443	44,154,695	87,612,666	112,757,295	200,369.961
Non-metallic minerals	1,184	280,033,057	26,662	33,958.541	86,312,529	89,433,536	175,746,065
Chemicals and allied products	561	134,618,839	14,559	18.656,851	63,630,588	63,854,084	127,484,672
Miscellaneous industries	447	111,178,478	18,518	23,739,923	34,699,896	44,466,809	79,166,705
Central electric stations	1,097	866,825,285	14,708	22,946,315	30,785,270	104,033,297	134,818,567
Total	22,936	4,337,631,558	618,933	693,932,228	1,789,574,604	1,635,923,936	3,425,498,540

Domestic Commerce.—No general attempt is normally made to value or tabulate the goods and commodities passing from one province to another, though this was done in the case of rationed commodities such as coal during the war, and in this case has been continued.

In the east, the Maritime Provinces have comparatively little in common with the neighboring provinces of Quebec and Ontario. Their trade is rather with Great Britain, the West Indies, and New England. At the same time a common protective tariff and specially low railway rates have done much to promote interprovincial trade. Coal is shipped in large quantities to Quebec. Fish also are being sent to Quebec and Ontario in much larger quantities than was formerly the case. Apples are sent in small quantities to the west, while the trade in certain manufactured goods is increasing. These consist of steel products, woollen goods, cars, foundry products, and confectionery. On the other hand, the goods obtained from Ontario and Quebec consist of beef, flour, and feed products; and among manufactured commodities the most important are household utensils and furnishings, ready-made clothes, boots, shoes, rubbers, and agricultural implements.

Quebec and Ontario constitute the second geographical unit, separated from the Prairie Provinces by the infertile country north of Lake Superior. These provinces are the chief manufacturing centre of Canada, producing in 1927 80 per cent. of the country's manufactures, and selling these products largely throughout the Dominion, as well as abroad. Ontario's trade with the middle west is larger than Quebec's. From Ontario, and to a less extent from Quebec, the west receives timber, beef and other animal products, some flour, and a good deal of feed for cattle. Manufactured products include agricultural implements in large quantities, household goods, clothes, and wearing apparel. From the west, Ontario and Quebec take large quantities of wheat, oats, and barley, and a few manufactured goods, such as flour, meats and canned fish, produced in Manitoba and British Columbia.

The Prairie Provinces and British Columbia constitute the third and fourth geographical units. British Columbia supplies the middle west with large amounts of timber and coal, fish (particularly canned fish), and an increasing amount of fruit, especially apples. From the Prairie Provinces, British Columbia receives the staple agricultural products to a limited extent, and also some cattle from the ranches of Southern Alberta.

External Trade.—The external trade of Canada has increased

Statistics of Manufactures by Provinces for 1927

Provinces	Establishments	Capital	Employees	Salaries and Wages	Cost of Materials	Net Value of Products
P.E. Island	291	3,081,504	2,232	687,849	2.855,438	1,638,190
Nova Scotia	1,190	128,155,040	17,864	13.610,944	42,059,320	32,398,977
New Brunswick	872	99,087,327	18,970	14,999,101	42,780.582	29,886,083
Quebec	7,206	1,376,654,019	196,094	203,724,997	474,361.396	516,221,599
Ontario	9,512	2,134,181,377	296,034	355,174,773	939,872,565	818,132,010
Manitoba	859	151,373,047	23,031	28,934,926	79,510,766	62,578,912
Saskatchewan	721	38,387,248	5,683	7,280,945	32,165,027	20,015,654
Alberta	776	81,664,730	11,285	13,511,359	50,611,021	34,376,296
British Columbia and Yukon .	1,509	325,047,266	47,740	56,007,334	125,358,489	120,676,215
Canada	22,936	4,337,631,558	618,933	693,932,228	1,789,574,604	1,635,923,936

Principal Statistics of Twenty Leading Manufacturing Industries, 1927

Industries	Establishments	Capital	Employees	Salaries and Wages	Cost of Materials	Net Value of Products	Gross Value of Products
	No.	$	No.	$	$	$	$
Pulp and paper . . .	114	579,853.552	32,876	45,674,293	84,813,080	134,516,673	219,329,753
Flour and grist-mill products	1,315	62,062,013	6,384	7,372,670	163,712,597	28,028,873	191,741,470
Slaughtering and meat-packing	76	60,612,029	11,048	14,551,250	133,076,361	34,144,531	167,220,892
Central electric stations .	1,097	866,825,285	14,708	22,946,315	30,785,270	104,033,297	134,818,567
Sawmills	2,720	169,378,939	44,598	34,421,544	77,438,700	56,181,854	133,620,554
Automobiles	11	88,831,668	11,063	18.862,846	88,451,757	40,248,757	128,700,514
Butter and cheese . .	2,872	43,375,302	11.126	11,162,645	93,101,006	29,422,876	122,523,882
Rubber goods, including footwear	44	66.266,064	15,065	16,621,543	44,724.502	46,689,228	91,413,730
Electrical apparatus and supplies	130	80,475,999	16,813	20,613,592	32,734,875	45,823,855	78,558,730
Non-ferrous metal smelting	10	85,366,662	7,671	12,120,240	32,516,687	45,479,578	77,996,265
Cotton yarn and cloth .	39	84,927,745	21,383	17,146.927	39,297,188	36,521,688	75,818.876
Railway rolling stock .	35	81,519,950	21,436	30,269,896	38,518.449	35,948,463	74,466.912
Castings and forgings .	328	89,505,687	19,149	24,267,396	26,792,119	42,603,224	69,395,343
Bread and other bakery products	2,443	40,559,259	14,414	16,068,147	35,779,690	32,946,572	68,726,262
Petroleum	23	56,135,564	3,856	6,188,226	53,059,921	11,468,899	64,528,820
Printing and publishing .	720	55,831,150	15,028	22,040,170	14,502,065	47,528,831	62,030,896
Sugar refineries . . .	8	50,039,122	2,711	3,839,488	47,138,854	13,363,810	60,502.664
Clothing, women's factory	428	24,259,925	15,597	15,550,496	31,899.654	24,416,410	56,316,064
Cigars and cigarettes . .	79	34,371,252	6,247	5.876,868	17,350,343	38,450,995	55,801,338
Hosiery, knit goods and gloves	168	56,852,077	17,217	14,177,165	28,269,830	26,952,565	55,222,395

enormously during the last fifteen years. To aid in marketing the products of the Dominion, the Government has subsidized lines of mail steamers running to Great Britain, Europe, the West Indies, Mexico, Australia, France and South Africa, and has even, like Australia, gone into the shipping business itself, building and operating in 1927 a fleet of some 46 freight steamers to Newfoundland, Cuba, the West Indies, South America and British ports, as well as an Australian service. The external trade for the fiscal year ending March 31, 1929, amounted to the grand total of $2,654,452,166.

A new classification of imports and exports according to chief component materials was adopted in 1919, the classes being as follows: (1) vegetable products (except chemicals, fibres, and wood); (2) animals and their products (except chemicals and fibres); (3) fibres, textiles, and textile products; (4) wood, wood products, and paper; (5) iron and its products; (6) non-ferrous metals and their products; (7) non-metallic minerals and their products (except chemicals); (8) chemicals and allied products; (9) all other commodities. In 1929, the exports of commodities belonging to the first class reached a value of $646,500,000; fourth class $288,600,000; second class $158,750,000 and sixth class $112,650,000. Exports in each of the other classes amounted to less than $100,000,000. Imports of class 5 goods amounted to $346,600,000; of class 1 to $233,000,000; of class 3 to $206,000,000; and of class 7 to $167,000,000, no other class showing imports as great as $100,000,000. Of the total value of exports, $500,000,000 went to the United States as against imports of $868,000,000, and $430,000,000 to the United Kingdom as against imports of $194,000,000. Of $1,228,000,000, the total value of domestic produce exported in 1928, $580,000,000 represented raw materials, $189,000,000 partly manufactured goods and $459,000,000 fully or chiefly manufactured goods.

Thirty Leading Commodities Imported into Canada, fiscal year ended Mar. 31, 1929

Commodity	Value
	$
Machinery	60,262,591
Automobile parts	55,761,414
Coal	55,654,851
Spirits	48,348,580
Automobiles	42,969,476
Farm implements	40,292,899
Crude petroleum	38,644,598
Plates and sheets (iron)	30,665,826
Raw cotton	28,204,281
Electric apparatus	26,776,215
Sugar for refining	26,405,199
Green fruits	25,915,836
Engines and boilers	19,307.250
Gasoline	18,038,367
Raw rubber	17,410,004
Raw furs	16,906,184
Silk fabrics and velvets	16,615,680
Books and printed matter	16,539,633
Corn	13,792,143
Worsteds and serges	13.727.659
Paper	13,649,415
Raw hides	12,429,221
Wood manufactures	12,386,421
Planks and boards	12,323,673
Structural iron and steel	11,828,234
Tea	11,752,521
Vegetable oils	10,809,181
Clay and its products	10.417,260
Settlers' effects	10,390,922
Colored or printed cottons	10,289,462

Thirty Leading Canadian Commodities Exported from Canada, fiscal year ended Mar. 31, 1929

Commodity	Value
	$
Wheat	428,524,326
Printing paper	142,343,064
Wheat flour	65,117,779
Planks and boards	47,663,849
Wood pulp	44,895,717
Automobiles	43,059,733
Fish	34,982,116
Copper, ore and blister	26,904,488
Barley	25,743,971
Cheese	25,181,853
Raw furs	24,250,172
Whiskey	24,122,725
Nickel	23,880,492
Meats	19,184,930
Rubber tires	19,119,839
Farm implements	15.870,918
Cattle	14,694,043
Pulp wood	14,187,100
Raw gold	12,396,444
Silver ore and bullion	11,839,928
Asbestos, raw	11,267,188
Lead	11,130,335
Rye	10,809,020
Oats	10,241,938
Leather, unmanufactured	9,591,900
Raw hides	9,479,691
Aluminium in bars	8,608,247
Rubber boots and shoes	8,589,849
Zinc	8,306,847
Shingles (wood)	7,793,271

In 1875 exports to Great Britain began to exceed those to the United States. In 1882 conditions were reversed, but in the years following Great Britain again came to the front as Canada's market until 1889. After the latter date, however, the United States steadily fell behind in the race until the Great War, which seriously reduced British purchasing power. In 1928–29 the United States took about 37 per cent. of Canada's total exports as compared with about 31½ per cent. going to the United Kingdom. On the other hand, the United Kingdom supplied only 15½ per cent. of Canada's imports, while the United States supplied no less than 68½ per cent. Canada's imports from the United Kingdom reached their lowest point in the fiscal year ended March 31, 1919, when they constituted only 8 per cent. of the total imports, as compared with 81½ per cent. from the United States.

The percentage value of imports from Great Britain reached its highest point, 59.2, in 1871–2. Then followed a decline until 1898–9, when the percentage was only 24.7. The percentage value of American imports had risen in the meantime from 32.1 in 1871–2 to 60.3 in 1900–1.

In the years since the war, imports from the United States, broadly speaking, approximate two-thirds of the total. Preliminary figures of total exports in the fiscal year ended Mar. 31, 1929, are given as $1,388,773,075 as against imports for consumption of $1,265,679,091. The so-called 'favorable' balance of trade for the year is therefore $123,093,984.

Tariff.—The existing customs regulations in Canada provide for three different rates of duties, the preferential tariff, the intermediate tariff, and the general tariff. In addition, a special 'dumping' duty and a surtax may be imposed.

The preferential tariff applies to goods produced or manufactured in the United Kingdom, British India, and most of the British colonies when imported direct from any British country. This tariff went into operation on Aug. 1, 1898, the duties on British goods being 25 per cent. less than those on foreign goods. On July 1, 1900, the preference was increased to 33⅓ per cent. A modification of this tariff in 1904 raised the duty on most of the woollen and worsted goods of British origin to 30 per cent., as against 35 per cent. on those of foreign origin, a preference of only $14^{2}/_{7}$ per cent. In 1922 the duties on cotton and woollen fabrics, and clothing, flannels, knitted goods, rubber clothing and boots and shoes were reduced by 2½ per cent. ad valorem, and on collars and cuffs by 5 per cent. ad valorem under the preferential tariff, the general tariff remaining unchanged. In 1923 a further discount of 10 per cent. of the preferential duty was given where commodities dutiable at more than 15 per cent. were directly imported into a sea or river port of Canada.

The intermediate tariff may be applied by Order-in-Council to the products of any British or foreign country. The duties there set forth are slightly lower than those of the general tariff. The intermediate tariff applied in 1928 to the products of France, her colonies and protectorates, Belgium, Italy and the Netherlands (under special treaties), also Argentina, Colombia, Cuba, Denmark, Finland, Japan, Norway, Spain, Sweden, Switzerland and Venezuela (under reciprocal most-favored-nation legislation). Further, arrangements entered into in that year and becoming effective by the end of the year granted most-favored-nation treatment to Czechoslovakia, Esthonia, Hungary, Latvia, Lithuania, Portugal, Roumania and the Serb-Croat-Slovene kingdom.

The general tariff applies to the imports from all countries not entitled to the preferential or intermediate tariff. It is decidedly protective in its nature, but numerous deductions have been made since 1921, mainly in the duties on instruments of production and on textiles and articles of clothing.

The special or 'dumping' duty is an additional tax which may be levied upon goods sold to a Canadian importer at a price lower than the market price in the country whence they are exported to Canada. This tax may not exceed 15 per cent. ad valorem.

Finally, goods exported to Canada from any country which treats Canadian imports less favorably than the imports from other countries may be subject to a surtax, not exceeding 20 per cent. ad valorem, over and above the general tariff.

Japan.—In 1906 a convention was signed and ratified by Great Britain and Japan, admitting Canada to the advantages of the conventions signed by the two contracting parties in 1894 and 1895. Canada is, therefore, entitled to the lower duties of the special Japanese tariff contained in the treaty. Since 1894, agreements have been concluded between Japan and France, and Japan and Germany, providing for lower duties on some articles not specified in the treaty of 1894, to the benefits of which Great Britain and Canada are entitled as well. Under the Japanese Treaty Act of 1913, Canada and Japan extend to each other's products most-favored-nation treatment.

France.—An agreement was concluded with France in 1907 by which certain specified products are admitted by either country at lower rates than those imposed by the ordinary tariffs. The Canadian articles enumerated are for the most part agricultural, mining, or fishing products in the raw state. The French commodities entitled to the lower treaty rates include wines, spirits, and other less important articles, generally in the nature of luxuries. The French Treaty was denounced in 1920, but in 1921 a French Trade Agreement was signed, Canada granting to France, subject to the usual reservation in favor of other portions of the Empire, most-favored-nation treatment. Certain Canadian articles were removed from the operation of the French minimum tariff, while certain others were granted its privileges. Belgium, Italy and the Netherlands have also been granted the lower duties of the intermediate tariff on many goods shipped directly from the country of origin or from a British port to a Canadian port.

United States.—An agreement for the free exchange of most natural products and a few manufactured commodities at reduced rates was rejected by Canada as a result of the defeat of the Liberal Government on this issue in the election of 1911. Canadian producers benefitted somewhat from the reductions in the American tariff under President Wilson, but consumers probably lost by the increased prices of certain raw products, which passed more freely across the border to the United States. During the war, in consequence of a provision of the American tariff and of the action of the Canadian Government in abolishing the duty on American wheat and flour, by order in council under the War Measures Act, wheat and flour and other less important commodities passed free of duty in both directions. This ended with the advent to power of the Republicans and the enactment of tariff measures, which seriously injured the Canadian farmer.

British West Indies.—The products of the British West Indies are complementary to rather than competitive with those of Canada. This feature was recognized in the West Indian Trade Agreement of 1913 under which Canada and the British West Indies gave specially favorable treatment to each other's products. In 1920 a trade conference between the Governments was held at Ottawa, and as a result an arrangement was effected under which Canadian customs duties on products of the British West Indies shall not be more than 50 per cent. of similar duties imposed on products of foreign countries, Canadian goods receiving an equivalent preference in the West Indies. A subsidized steamer service between St. John or Halifax and West Indian ports was also arranged. A further agreement between Canada and the British West Indies was signed on July 6, 1925, under which duties levied on dutiable goods other than tobacco and liquors from any of the colonies are not to exceed 50 per cent. of the general tariff. Separate steamship services have also been arranged for between Canada and the Eastern and Western groups of the West Indies and neighboring colonies.

See also the article TARIFF.

Finance.—On Mar. 31, 1928, the gross debt of Canada was $2,677,137,243, with active assets amounting to $380,287,010, leaving a net debt of $2,296,850,233, a decrease of $50,984,137 during the year. The total receipts under the division consolidated fund for the fiscal year ending March 31, 1928, amounted to $422,717,983, besides $6,924,594 of special revenue, an increase of $29,189,097 over the preceding year in spite of considerable reductions in taxation. The expenditure under the same head was $336,167,961. In addition, there were special expenditures of $3,361,322, capital expenditures of $20,635,648 (mainly on the Welland Ship Canal and the Hudson Bay Railway) and other expenditures (mainly the charging off of old obligations due to the government) amounting to $18,493,509, bringing the grand total expenditure to $378,658,440. On Oct. 15, 1928, the national debt was reduced by the paying off out of surplus revenue of $53,000,000 of 5 per cent. bonds falling due on that date. On August 1, 1929, $60,000,000 of 5½ per cent. bonds then due were paid off out of surplus revenue.

Direct Taxes.—In 1915 the Dominion Government, in anticipation of impending deficits and in addition to the increase in indirect taxes, decided to resort to the use of direct taxes which previously had been informally understood to be reserved to the provinces. Under the Special War Revenue Act of 1915, direct taxes of one per cent. were imposed on the average note circulation of the banks, on the gross incomes of trust and loan companies, and on the net premiums of insurance companies other than life, marine, and fraternal insurance companies. Taxes were also levied on telegrams, railway and steamship tickets, checks, bills of exchange, money orders, letters, post cards, patent medicines, and wines.

In 1916 the Business Profits War Tax Act was passed, and to a certain extent was made retroactive. It was applicable to all persons, firms, and incorporated companies engaged in business, but exceptions were made in favor of insurance companies and persons engaged in agriculture. Moreover, individuals and incorporated companies whose capital was less than $50,000 were exempt unless engaged in manufacturing war supplies. In the case of incorporated companies the tax was placed at 25 per cent.

on profits in excess of 7 per cent. of the capital, while individuals were taxed 25 per cent. on their excess of profits over and above 10 per cent. on their capital. In 1917 this act was amended, in 1918 its operation was extended to businesses with a capitalization of from $25,000 to $50,000, and in 1919 the tax on such businesses was fixed at 25 per cent. of profits in excess of 10 per cent. on capital. In 1920 the tax was modified and in 1921, the period of large profits being over, the tax was discontinued.

In 1917 an income tax was introduced and adopted with general approval. This tax was, generally speaking, based upon the Federal income tax of the United States and the income tax of the United Kingdom. When the income tax was passed it was officially announced that the business profits war tax would be repealed, but in view of public opposition it was retained until the end of 1920.

A sales tax was established in 1920, the rate being raised in 1921 to 1½ per cent. on transactions between manufacturers and wholesalers or jobbers and also between these and retailers or consumers, and to 3 per cent. on sales made directly by the manufacturer to the retailer or consumer. These rates were further increased by 50 per cent. in 1922, and raised in 1923 to a general rate of 6 per cent. Returning prosperity has brought about a gradual reduction to a rate of 2 per cent. in 1929.

In the last few years, the growing prosperity of Canada has made it possible to reduce or abolish many of the taxes imposed during the war. Income tax is now collected only from single persons with incomes of $1,500 or over and married persons with incomes of $3,000 or over, while the normal rate has been reduced to 2 per cent. and $500 exemption is allowed for each dependent child, so that a married man with 2 children pays only $20 on an income of $5,000. The tax on receipts has been abolished and the tax on checks has been reduced to a flat 2 cents on checks for $10 or over. Two cent postage has also been restored. (See SALES TAX.)

Loans.—In order to meet the deficit of over $104,000,000 for the fiscal year 1914–15 the Government issued $26,000,000 in Dominion notes in excess of the amount allowed by law and unprotected by gold, a transaction which was legalized by Act of Parliament in 1915. In addition, $60,000,000 was borrowed from the British Government, $15,000,000 in treasury bills and $6,500,000 in Dominion stock were sold in London, and $5,000,000 was borrowed from the Bank of Montreal.

In the fiscal period 1915–16 about $182,000,000 was needed to meet the deficit, to retire the treasury bills, and to pay the Bank of Montreal. For these purposes $25,000,000 of 1920–25 debenture stock were sold in London, treasury bills to the value of $45,000,000 were sold in New York, and $100,000,000 was borrowed in Canada.

The deficit for 1916–17 amounted to $157,000,000. A loan of $75,000,000 was floated in New York, and in September, 1916, $100,000,000 was borrowed in Canada. During the calendar year 1917 two more loans were floated in Canada—one in March for $150,000,000, while a second in November was allotted for $400,000,000; but this gross sum includes a certain amount subscribed not in cash, but in holdings in former loans.

Further, $100,000,000 of 5 per cent. 2-year notes were floated in New York. The fifth domestic war loan, floated in November, 1918, was applied for by over 1,000,000 subscribers and totalled $660,000,000, while the sixth loan for demobilization and re-establishment expenses, issued in November, 1919, realized $678,000,000. The raising of a loan of $350,000,000 to pay off maturing war debt was authorized by Parliament in 1922. As a result of the unlooked-for success of the various domestic loans during the war, the Canadian Government was able to advance large sums to the British government. The same policy was also adopted by the Canadian banks. On the other hand, the British government paid all expenses for the maintenance of Canadian troops abroad, and debited Canada with a charge of $1.50 per soldier per day.

Banks and Currency.—There are 10 banks in Canada, with branches scattered over the country from the Atlantic to the Pacific. On Dec. 31, 1928, the number of branch banks in Canada was 3,966. Canadian banks also have branches in England, Newfoundland, the West Indies, and the United States. These foreign branches numbered at the above date 187. This branch system, adapted from the method followed by the Scotch banks, offers signal advantages in insuring security to depositors, and in establishing uniform rates of exchange and interest in a large and sparsely settled country.

All banks are chartered by the Dominion Government, and no new bank is incorporated unless its capital stock is at least $500,000, half of which must be paid up before it is allowed to begin business. The finances of the banks are based on gold and Dominion notes redeemable in gold. They are not compelled by law to maintain a minimum reserve, but 40 per cent. of such reserve as they find it expedient to provide must be in Dominion notes. The Government is bound to hold as security for the notes not in excess of $76,000,000 which it issues, $16,000,000 of railway securities guaranteed by the Dominion. For the protection of all notes issued in excess of $76,000,000 an equal amount in specie would normally be maintained, but during the war the Dominion was authorized to issue to the banks Dominion notes uncovered by specie against the deposit of approved securities in time of war or panic. This was made a normal feature of the banking system in 1923.

The chartered banks are allowed to issue notes to the amount of their unimpaired, paid-up capital, and they may in addition, during the harvest period, when the crops are being moved (from the first of September to the last of February), issue notes equal in value to 15 per cent. of their combined paid-up capital and reserve—such issue in excess of their paid-up capital being subject to a tax of 5 per cent. By an amendment to the banking act, passed in 1913, banks may also issue notes equal to the amount of a reserve deposited in the central gold reserves. These reserves must be in the form of gold or Dominion notes. The notes so issued are in addition to the issue based on paid-up capital, and are not subject to the 5 per cent. tax imposed upon the issue based on capital and rest during the harvest period. However, since 1915 all banks have paid a tax of 1 per cent. per annum on their average notes in circulation.

The minimum value of a bank note is $5. Bank notes may also be issued in multiples of five. One, two and four dollar notes are issued by the Government alone. Bank notes form a first lien on the assets of the bank issuing them, which must maintain facilities for redeeming them in the principal cities of the Dominion, and in addition must maintain with the Government an amount of gold equal to 5 per cent. of their average monthly note circulation, from which 'bank note circulation redemption fund' all notes of failed banks are redeemed on presentation.

Monthly statements must also be furnished to the Government. In the event of the failure of a bank, its notes bear interest at 5 per cent. until they can be redeemed; the 5-per-cent. deposit made by it, and, if necessary, by other banks, may be drawn upon for the immediate redemption of notes, and each shareholder is liable for a sum equal to the par value of the shares held by him, in addition to any amounts not paid upon such shares. Finally, the other banks may also be called upon to make good the losses to note holders, but not to depositors of failed banks.

On March 31, 1928, there were in circulation Dominion notes to the amount of $221,894,063, nine-tenths of which amount was large notes in the hands of the banks. The aggregate of bank notes in circulation, these forming the bulk of the currency in the pockets of the people, was $188,726,256. The paid-up capital of the 10 banks at the same date amounted to $132,421,228, the assets to $3,494,089,109, and the total liabilities to the public to $3,188,914,875.

Shortly after the outbreak of the war the Dominion Government announced that there had been an over-issue of Dominion notes to the value of $26,000,000. This over-issue still remains in circulation legalized by an Act of 1915. Moreover, the Government has adopted as a normal feature of the system the practice of issuing notes to the banks upon the deposit of approved securities, after the model of the U. S. Federal Reserve Act.

On April 30, 1929 there was an available gold reserve in the hands of the Dominion Government of $58,771,399 against Dominion notes to the amount of $105,151,681, exclusive of $84,000,000 outstanding against approved securities and $16,000,000 issued under authority of the Dominion Notes Act of 1915. The excess Dominion notes have in the main been advanced to the banks upon the deposit by them of approved securities with the Minister of Finance, just as Federal Reserve notes are advanced to banks in the United States. Dominion notes have been redeemable in gold since July 1, 1926. Bank notes are not legal tender, but are accepted as freely as Dominion notes. The Canadian dollar, which was as low as 82 American cents in 1920, has thus recovered its par value, which is the same as that of the United States dollar.

Area and Population.—The area of Canada in 1928 was 3,684,723 square miles, of which 3,542,049 square miles is land and 142,674 square miles is water. This area was reduced by 112,400 square miles (106,970 square miles of land and 5,430 square miles of water) as a consequence of the award of the Judicial Committee of the British Privy Council in the boundary dispute between Canada and Newfoundland.

In 1921 the population was 8,788,483, compared with 7,206,643 in 1911—an increase of 1,581,840, or 21.95 per cent. The rural population in 1921 was 4,439,505, compared with 3,925,679 in 1911—an increase of 513,826, or 13 per cent. In 1921 the urban population was 4,348,978, compared with 3,280,964 in 1911—an increase of 1,068,014, or 32 per cent.

The largest absolute increase in total population was in Ontario, followed by Quebec, Saskatchewan, Alberta, Manitoba, and British Columbia in the order named, all of these increases being over 100,000 in the decade. In the Maritime Provinces (Nova Scotia, New Brunswick and Prince Edward Island) the increases were comparatively slight, the last named showing an actual decrease as did also the Yukon. The largest percentages of increase were in Alberta and Saskatchewan (over 50 per cent.), followed by British Columbia, Manitoba, Northwest Territories, Quebec, Ontario, New Brunswick and Nova Scotia, in the order named. On the other hand, Prince Edward Island, an almost purely agricultural community, and the Yukon Territory, mainly a mining camp, lost 5 per cent. and 51 per cent. respectively of their population.

Area and Population of Canada (1921)

Provinces	Area (sq. m.)	Pop. 1921	Increase per cent. 1921 over 1911
Alberta	255,285	588,454	57.22
British Columbia	355,855	524,582	33.66
Manitoba	251,832	610,118	32.23
New Brunswick	27,985	387,876	10.25
Nova Scotia	21,427	523,837	6.40
Ontario	407,262	2,933,662	16.08
Prince Edward Island	2,184	88,615	−5.46
Quebec	706,834	2,361,199	17.72
Saskatchewan	251,700	757,510	53.80
Yukon	207,076	4,157	−51.16
Northwest Territories	1,242,223	7,988	22.76
Royal Canadian Navy	....	485	....
Totals	3,729,663	8,788,483	21.95

All of the western provinces, including British Columbia, showed large increases, both in rural and urban population, all having greater absolute increases in rural than in urban population, and all but Saskatchewan and Alberta greater relative increases. Of the eastern provinces, Ontario and New Brunswick showed some absolute increase in rural population, while Nova Scotia, Quebec, and Prince Edward Island experienced a decline. In each of these provinces, urban population showed a greater absolute increase than rural, more especially in Ontario and Quebec, the manufacturing centres of the Dominion.

In Canada the details of the census of 1921 show that, as in the United States, the westward movement of population continues. At the first census of the Dominion, taken in 1871, only 3.4 per cent. of the population resided west of Ontario. In 1881 the percentage was 3.5; in 1891, 7.3; in 1901, 12; in 1911, 24.1; and in 1921, 28.3. On the other hand, the three Maritime Provinces, which in 1871 contained 20.3 per cent. of the population of the Dominion, had in 1881, 19.8 per cent. in 1891, 18.2 per cent.; in 1901, 16.7 per cent.; in 1911, 13 per cent.; and in 1921 only 11.4 per cent. of the country's population. Their people migrated in large numbers to the fertile farms of the prairies or to the industrial cities of Ontario and Quebec, as well as to Boston and New York. Ontario and Quebec, which before 1867 constituted the old Province of Canada, still contribute the largest element to Canadian population, though their percentage has gradually declined from 76.24 in 1871 to 60.25 in 1921.

The areas and population of the various provinces and districts are shown in the accompanying table.

The population of the principal cities and towns in 1921 was as follows: Montreal, 618,506; Toronto, 521,893; Winnipeg, 179,087; Vancouver, 117,217; Hamilton, 114,151; Ottawa, the capital, 107,843; Quebec City, 95,193; Calgary, 63,305; London, 60,959; Edmonton, 58,821; Halifax, 58,372; St. John, 47,166; Victoria, 38,727; Windsor, Ontario, 38,591; Regina, 34,432.

At the quinquennial census of the Prairie Provinces (Manitoba, Saskatchewan and Alberta) in 1926, the populations of these provinces were recorded as follows:—Manitoba, 639,056; Saskatchewan, 820,738, Alberta, 607,584, being a total of 2,067,378, as compared with 1,956,082 in 1921. The rate of growth was thus 5.69 per cent. in the five years, which included the period of the great agricultural depression of 1921–24, which severely affected these grain-growing provinces.

The populations of the chief cities in the Prairie Provinces in 1926 were Winnipeg, 191,998, Calgary, 65,513, Edmonton, 65,163, Regina, 37,329, Saskatoon, 31,234.

Immigration.—Largely as a result of the opening up of virgin wheat land in the provinces of Manitoba, Saskatchewan, and Alberta, there has been a marked influx of population into Western Canada since the beginning of the century. The great fertility and productivity of this new country have attracted many farmers and farm laborers from the American West and the United Kingdom. There were also before the war many arrivals from Eastern Europe, largely attracted by the demand for railway 'navvies' and miners. However, the English-speaking element largely outnumbers those of other nationalities, and the educational authorities are actively at work in 'Canadianizing' the children of the continental Europeans.

Any person who is the sole head of a family, or a male over eighteen years of age, may 'homestead' a quarter section (160 acres) of Crown lands in the provinces of Manitoba, Saskatchewan, and Alberta, or in the Territories. The Canadian Pacific Railway also has land for sale, and is offering 'ready-made' farms for sale or lease.

The numbers of immigrants who have arrived within recent years are shown in the accompanying table.

Canadian Immigration, 1915–1929

Year*	From United Kingdom	From United States	From All Countries
1915	43,276	59,779	144,789
1916	8,664	36,937	48,537
1917	8,282	61,389	75,374
1918	3,178	71,314	79,074
1919	9,914	40,715	57,702
1920	59,603	49,656	117,336
1921	74,262	48,059	148,477
1922	39,020	29,345	89,999
1923	34,508	22,007	72,887
1924	72,919	20,521	148,560
1925	53,178	15,818	111,362
1926	37,030	18,778	96,064
1927	49,784	21,025	143,991
1928	50,782	25,007	151,597
1929	58,880	30,560	167,722

*Ending March 31.

Any immigrant may be deported within five years after arrival, if he has, during that period, become a public charge or an inmate of a prison, hospital, or charitable institution.

All British subjects from the United Kingdom or from the British Dominions are eligible to enter Canada, provided they are sound mentally and physically and in a position to maintain themselves until employment can be found. Special encouragement to agricultural workers and their families and to domestic workers is extended in the form of low ocean rates of £2 from port to port, with free passage for children under 17, together with low railway rates. British children over 14 and under 17 are also brought to Canada under the auspices of certain juvenile societies and are given supervision in their new homes by officials of the Government.

Citizens of Northern European countries, including Scandinavia, Germany, Switzerland, Holland, Belgium and France, are eligible for entry into Canada if sound mentally and physically and in a position to maintain themselves until employment can be found. The same applies to immigrants from the United States, but in all such cases no financial assistance is given. Immigrants from the Central and Southern European countries are only accepted if they are agricultural workers, domestic servants or closely related to residents already legally admitted to Canada; exceptions may be made where the Minister of Immigration is satisfied that their labor or service is required in Canada.

Chinese immigrants, since the passage of the Chinese Immigration Act of 1923, have been admitted to Canada only in rare cases. Immigration from Japan is regulated by the 'gentleman's agreement' between the Canadian and Japanese Governments, under which the Japanese Government grants only a small number of passports for Canada and the Canadian Government admits only those Japanese to whom passports have been granted and who are otherwise acceptable. Japanese to the number of 445 migrated to Canada in the fiscal year ended March 31, 1929. Immigration from the East Indies is also restricted and only 52 such immigrants were received in this latest fiscal year.

Language.—English is spoken or understood almost everywhere, except in the rural parts of Quebec, where French alone is understood by many of the *habitants*. French is also spoken in parts of Eastern Ontario, where the French-Canadians have settled, and in a few small communities in the West. The English-speaking people of most of the Eastern townships in Quebec are being supplanted by French-speaking Canadians. French and English are official languages both in the Dominion Parliament and in the Quebec legislature. In the latter French is commonly used to the exclusion of English, but in the Dominion Parliament even the French-Canadians generally prefer to speak English.

In the towns and cities of Quebec it is highly desirable for professional and business men to know both languages; and this is required in the case of civic employees and corporation officials who come into close contact with the public. There has recently been a marked movement in Quebec to preserve and perpetuate the language of old France, a movement which owes its origin to the Nationalists and to the Roman Catholic church.

Religion.—There being no state church in Canada, priority among the denominations is determined by numbers only. The Roman Catholic church has a privileged position in Quebec, with the legal right to collect tithes from all her members.

The Church of England has 4 archbishops and 21 bishops, with about 1,618 clergy and 785 licenced lay readers; the Roman Catholics, 11 archbishops, 37 bishops, and over 7,000 clergy; the United Church of Canada, formed in 1925 by a union of the Methodists, Congregationalists and a majority of the Presbyterians, 4,700 ministers, including 600 foreign missionaries; the 'continuing' Presbyterians, 654 ministers; and the Baptists, 735. Religious statistics obtained from the census of 1921 show the number of persons belonging to the larger denominations as follows:

Roman Catholics	3,389,636
Presbyterians	1,409,407
Anglicans	1,407,994
Methodists	1,159,458
Baptists	421,731
Lutherans	286,458
Greek Church	169,832
Jews	125,197
Mennonites	58,797
Congregationalists	30,730

The proportion of each of the larger denominations to the total population in 1911 and 1921 was as follows:

	1911	1921
Roman Catholics	39.31%	38.57%
Presbyterians	15.48	16.04
Anglicans	14.99	16.02
Methodists	14.47	13.19
Baptists	5.31	4.80
Lutherans	3.19	3.26
Greek Church	1.23	1.93
Jews	1.04	1.42
Mennonites	0.62	0.67
Congregationalists	0.47	0.35

Education.—Canada's free educational system is in the hands of the provinces, except in so far as the British North America Act secures the permanence of the denominational schools which existed at the time of Confederation. In 1905 the Federal Government passed acts concerning education in the new provinces of Alberta and Saskatchewan. In Ontario, Quebec, Alberta, Saskatchewan, and the Northwest Territories there are separate schools for Roman Catholics; in the other provinces, the schools are nominally non-sectarian; but as a result of a compromise, the Roman Catholics really have separate schools in the larger towns and cities. Teachers are trained in the main at provincial normal schools. In 1926–27 the expenditure amounted to over $125,876,375. On the average, one-seventh is contributed by the Provincial Government, and the remainder by the inhabitants of the school districts.

With the exception of Quebec all the provinces have laws of compulsory education, but under differing conditions. As a rule, the provincial laws provide for uniformity in the training of teachers, the use of textbooks and the grading of pupils. Secondary schools or departments, and colleges or universities for higher education exist in all the provinces, and the three classes of teaching institutions are more or less coördinated to allow of natural transition from the lower to the higher. Arrangements for the superannuation of teachers are applied in most of the provinces.

There are 23 institutions which grant degrees, of which perhaps ten are universities in the true sense of the word. (See Table of Canadian Universities under the heading COLLEGE.)

In 1901, of the total population of the age of five years and over, 129,584 could read but not write. In 1911 there were only 32,863 and in 1921 58,254 who could read but not write. In 1901 there were 680,122 who could neither read nor write; in 1911 the corresponding number was 663,453 and in 1921, 715,167. In 1901 the percentage of those who could neither read nor write was 14.38; in 1911 it was 10.50 and in 1921, 9.25.

In the more significant comparison for those 10 years of age and over, the proportion unable to read and write was 5.10 per cent. in 1921, or 4.49 per cent. if Indians are excluded. In Ontario, the percentage above 10 years of age unable to read or write was 2.96 in 1921, rising to 7.09 per cent. in Manitoba and 7.21 per cent. in New Brunswick. There has been increasing activity in, and expenditure upon, education during recent years, and progress has been marked, more particularly in technical and vocational education, where the Dominion Government has extended financial assistance to the extent of $10,000,000, divided among the provinces in the ten years 1919 to 1929. Statistics for the latest year available (1926 or 1927), compiled by the Dominion Bureau of Statistics, place the number of teachers in elementary and secondary schools under public control at 66,004; with 1,944,771 pupils enrolled, and an average attendance of 1,576,728. The total number enrolled in all educational institutions, so far as known, was 2,291,763.

(See EDUCATION IN CANADA and the articles on the separate provinces.)

Army.—The Canadian militia, which is administered by the Dominion Government, is under the control of a defence council, presided over by the Minister of National Defence. Certain of the 11 militia districts into which Canada is divided are grouped under commands, each command being under the control of a senior officer, with power to deal with all subjects not involving a question of policy. Service in the militia may be made compulsory for all men between the ages of 18 and 60. Service in the active militia is for 3 years, with 8 to 16 days' annual training. The Permanent Active Militia in 1928 consisted of 3,684 officers and men and the Non-Permanent Active Militia of 124,879 officers and men.

In order that a sufficient number of officers may be available in case of necessity, Officers' Training Corps have been established at many of the Canadian universities and colleges. The Minister of Militia has made arrangements with the Educational Departments of several provinces to furnish military instruction to the boys.

The fortifications at Halifax and Esquimalt are now maintained by the Canadian Government. Military instruction is given by the Royal Military College in Kingston, and by McGill and other universities through their Officers' Training Corps.

On Aug. 1, 1914, the Canadian Government offered the British Government an expeditionary force in case Great Britain should become involved in the war. The offer was accepted, and in the autumn of 1914 a Canadian army of 33,000 men left Quebec for England. This force was increased to 63,000 men during the same year, to 150,000 by July, 1915, and to 250,000 by October, 1915; but during 1916 recruiting fell off. Early in the same year the Premier announced that Canada's contribution of men should be 500,000, and this promise was interpreted as a pledge made on behalf of the government and the people whom they represented. By March, 1917, the Canadian troops which had actually left Canada numbered 326,000 men, of whom 130,000 were in France. In addition, some 40,000 reservists had also left Canada, and were serving in the Allied armies. In June, 1917, there were 136,000 Canadian troops in France, about 900 in the West Indies and Near Eastern countries, and 108,736 in England—not counting those in hospitals and convalescent homes; while 17,353 were still in Canada. The total number of Canadians who were actually sent overseas up to the date of the Armistice was 418,052, while the total number of enlistments was 595,441.

Navy.—An act entitled 'An Act Respecting the Naval Service of Canada' was passed by the Canadian Parliament in 1910. This Act provided for the creation of a naval force to consist ultimately of 11 ships, at an estimated annual expenditure of $3,000,000 and a total estimated expenditure of $11,000,000. Its provisions were based upon the Militia Act, with the exception that under no circumstances should naval service be compulsory.

Two training ships, the *Niobe* and the *Rainbow*, were purchased from the British Government. The *Niobe*, a protected cruiser, was stationed on the Atlantic Coast; the *Rainbow* on the Pacific Coast. Nothing further was done in addition to the purchase of the *Niobe* and the *Rainbow*, which were used as training ships for naval cadets. A bill providing for the expenditure of $35,000,000 for the purpose of providing three battleships to be added to the British fleet was passed by the House of Commons in the session of 1912–13. The Senate amended the bill by requiring a referendum to the people before it should go into effect, and this amendment was rejected by the House of Commons. Shortly after the outbreak of the war two submarines, which were constructed in the United States for the Chilean Government and had been rejected by them, were purchased by the Dominion Government and stationed on the British Columbia Coast.

The *Niobe*, the *Rainbow*, and the two submarines were 'scrapped' after the war, the Government accepting in place of them a gift of ships from the British Government including the *Aurora*, a fast light cruiser built in 1914, two destroyers built in 1916, and two submarines built in 1918.

The Canadian navy had in

1928 a strength of 94 officers and 616 men, manning the two new destroyers and five minesweepers which are in commission. Officers are periodically exchanged with the British navy. Naval training establishments and naval dockyards are maintained at Halifax and Esquimalt. In addition to this permanent service, a naval reserve of 70 officers and 430 men and a naval volunteer reserve of 70 officers and 930 men receive a limited amount of training annually.

Air Force.—The Canadian Air Force, under the Chief of the General Staff, administers and controls all military air operations. Its functions are to provide adequate training facilities for Government air service, to provide a nucleus air force in event of war and to build up a reserve of pilots and mechanics. The permanent Air Force had at the end of 1928 a strength of 87 officers and 581 other ranks. Its principal station was at Camp Borden, Ontario, and there were also units at Vancouver and Ottawa.

Government.—The Constitution of Canada is of a federal character, all powers not specifically granted to the provinces being exercised by the Dominion Government. Briefly, it is the British Constitution federalized.

The executive authority of the Federal Parliament is vested in the King, and is carried on in his name by a Governor-General and Executive Council or Cabinet, consisting of the outstanding members of the political party having a majority of the House of Commons, and bound to give place to others as soon as they cease to command the support of a majority of the House of Commons. The Governor-General, who is appointed by the King, has the right to disallow or reserve bills passed by Parliament—a power which has only once in the 55 years since Confederation been exercised, and then in a purely technical matter.

The legislative authority is exercised by a Parliament of two houses, the Senate and the House of Commons. The members of the Senate are appointed by the Governor-General-in-Council and hold office for life. There are at present (1929) 96 Senators. The Senate has relatively little power or influence, and does not initiate, amend, or refuse its consent to money bills. The House of Commons is composed of 245 members, chosen by what is practically adult suffrage. The Government has the power to disallow any act passed by a provincial legislature, though this again has rarely been exercised. There is no recent instance of the disallowance of provincial legislation. The Federal Parliament is quinquennial, unless sooner dissolved, and sits at Ottawa (q.v.), the capital.

Each of the nine provinces of Canada has a separate legislature, with a Lieutenant-Governor appointed by the Governor-General-in-Council and holding office for five years. The Lieutenant-Governor, like the Governor-General, is advised by a Ministry or Cabinet composed of the leading men of the party having the support of the majority of the legislature. All the provinces except Quebec have but one house, called the Legislative Assembly, whose members are chosen by popular suffrage. The upper house in Quebec, called the Legislative Council, is composed of members appointed for life by the Lieutenant-Governor-in-Council—that is, by the government of the day. The provinces legislate on matters which relate solely to local affairs. Provincial legislatures are generally quadrennial, unless sooner dissolved, but the British Columbia legislature has been quinquennial since 1913.

The Northwest Territories (q.v.) are governed by a Commissioner and Council of four members, appointed by the Governor-General-in-Council. The Yukon (q.v.) territory is governed by a Commission appointed by the Governor-General-in-Council, and an Executive Council of 10 members elected by the people.

The Judiciary includes a Supreme Court in Ottawa, having appellate, civil, and criminal jurisdiction over the whole Dominion; an Exchequer Court; a Superior Court in each province; and County Courts—the members of all these courts being appointed for life by the Governor-General-in-Council. In certain cases there is an appeal from Canadian Courts to the Judicial Committee of the Privy Council, sitting in London.

Recent Legislation.—In 1923 important legislation included the decennial revision of the Bank Act (the charters of the chartered banks of Canada lapse every 10 years to provide an opportunity for revisions required in the public interest). More complete returns were henceforth required from the banks, and detailed provisions were made for a shareholders' audit of their affairs. Trade agreements with France and Italy were approved, and the Chinese Immigration Act prohibited Chinese immigration to Canada.

At the 1924 session the laws included acts providing for the superannuation of civil servants on a contributory basis, for the redistribution of the seats in the House of Commons in accordance with the results of the census of 1921, for the perpetuation and extension of the powers of the honorary advisory council for scientific and industrial research. A trade agreement with Belgium was also approved.

In 1925, as the result of the report of a grain inquiry commission, the Canada Grain Act was radically revised in the interests of the producers; large authority was placed in the hands of the Board of Grain Commissioners and their inspectors. Also, as the consequence of a decision of the British Privy Council declaring that the well known Industrial Disputes Investigation Act of Canada infringed the constitutional rights of the provinces, that Act was amended to provide that it should be resorted to only where the provinces had passed legislation to make it operative in their province.

The legislation of 1926, as the result of the indecisive election of 1925 and the consequent difficulty of administration, was not heavy. It included notable reductions in the rates of the income tax, the sales tax, and in the duties on automobiles, together with a trade agreement with the West Indies.

In 1927 the Farm Loan Act established a system of long term mortgage credit at low interest to farm borrowers, where the province would also provide part of the fund required. A Federal District Commission was set up for the beautifying of the capital, with wider powers than those exercised by the older Ottawa Improvement Commission. A system of old age pensions was also provided where provinces would manage the system and bear half the cost of the pension. To assist the depressed Maritime Provinces, reductions in railway rates were provided at the cost of the nation, in order to stimulate interprovincial trade.

In 1928 trade treaties or conventions providing for reciprocal most-favored-nation treatment were approved with Czechoslovakia, Spain, Esthonia, Hungary, Latvia, Lithuania, Portugal, Roumania and the Serb-Croat-Slovene State.

Provincial legislatures have within recent years passed much valuable legislation on such subjects as workmen's compensation, minimum wages, and mothers' pensions, while they are paying much attention to public health and particularly to venereal disease and the drug habit. As a result of the temperance sentiment aroused during the war the legal prohibition of alcoholic liquors existed for some time in nearly all the provinces; but the dying down of this feeling and the fiscal necessities of the provincial governments have brought it about that in 1929 all of the provinces except Nova Scotia and Prince Edward Island have inaugurated systems of government control of the sale of liquor, securing the profits of the traffic for the public treasury (see PROHIBITION).

History.—In 1534 Jacques Cartier landed on the Gaspé coast of Quebec, of which he took possession in the name of Francis I., king of France. However, nothing was done toward the permanent occupation and settlement of Quebec till 1608, when Samuel de Champlain, who had visited the country in 1603 and in 1604, founded the city. In the meantime (1604–5), French settlements were made in what are now the Maritime Provinces, but known to the French as Acadia (q.v.), where De Monts established a permanent agricultural population at Port Royal (now Annapolis Royal). France claimed, as a result of this settlement, exclusive control of the whole region from Acadia west to Lake Superior, and down the Mississippi to the Gulf of Mexico.

The control of this region was contested by England, who claimed part of it through right of prior discovery. In 1670 a charter was granted by Charles II. to Prince Rupert to found the Hudson's Bay Company, with exclusive rights of trading in the Hudson Bay basin. A long struggle was carried on between England and France for the control of the North American Continent, which ended in the cession of Acadia, Newfoundland and the Hudson Bay Territory by the Treaty of Utrecht in 1713, and the cession of Canada by the Treaty of Paris in 1763. Of all its Canadian territory, France retains only the islands of St. Pierre and Miquelon, off the coast of Newfoundland. The French shore rights, which were for long a cause of friction, in the end were renounced by France under the Anglo-French convention of 1904.

During the War of American Independence Canada was invaded by the Americans, and the end of the war saw a great influx of loyalists from the United States, and the formation of the province of New Brunswick (previously part of Nova Scotia). The treaty of peace in 1783 took away from Canada territory now included in Minnesota, Michigan, Ohio, Indiana, Illinois, and Wisconsin.

By the Treaty of Paris (1763) the French in Quebec received the guarantee of the free exercise of their religion. This guarantee was continued by the Quebec Act of 1774, and in addition the old French civil law was declared binding, while the criminal law was superseded by that of England. During the period from 1763 to 1791 Canada was ruled by the despotic *régime* established at Quebec—satisfactory neither to the French, nor to the increasing English population in the present province of Ontario. The attempt on the part of the Americans to take advantage of this discontent and to enlist the French, who had never experienced any but despotic government even before the conquest of Canada, against English authority failed. At the close of the American Revolution, many Loyalists settled in Ontario. They had been accustomed to a democratic form of government in their old homes, and naturally protested strongly against the absolutism in power at Quebec. As a result, Upper Canada, which was English in population and sentiment, was separated from Lower Canada in 1791, and an elected assembly was granted to each.

In Lower Canada discontent arose at an attempt to establish a system of free schools, and in other matters a spirit of antagonism developed between the French and English elements of the population. For a time the War of 1812 (q.v.) united both sides in loyalty to the Crown; but on the conclusion of peace, in 1814, matters began rapidly to reach a crisis. Open strife arose between the non-responsible executive council and the popular assembly, the French-Canadian leaders claiming the rights of Englishmen to control their government, and a new source of trouble between Upper and Lower Canada came to the front—a dispute as to the share which each should have of the import duties on commodities brought through the common *entrepôt*, Montreal.

Discontent resulted in rebellion in both provinces (1837–8)—a rebellion which was primarily a protest against an irresponsible executive. Lord Durham, sent over by England with authority to crush the insurrection, reported in favor of responsible government, which was granted in 1841, when the two provinces were again united. The English element in the united province as a rule divided on party lines, while the French presented a combined and solid front to the common enemy, and were thus enabled to hold the balance of power. Deadlock followed deadlock. The union of the various colonies under a federal form of government was proposed as the solution of a difficult problem, and in 1867 Canada, Nova Scotia, and New Brunswick united to form the Dominion of Canada.

During the period 1841–67 the commercial preferences enjoyed in the English market were removed; the Crown lands and civil list transferred to the colony; and the British cabinet system, with the practice of the House of Commons in the exercise of government, gradually introduced. Self-government was granted Prince Edward Island (1850–1), Newfoundland (1856), and British Columbia (1863).

The essential features of Canadian history since 1867 have been the consolidation of the constituent elements of the Confederation, and its expansion to include those provinces and territories not under its control in 1867. Newfoundland declared for union through its legislature, but the people in the election of 1869 refused their consent. During the next year the Northwest Territories were included. This provoked the resentment of the French half-breeds and Indians in the Red River Settlement. They rebelled at this time, and again in 1885, but the rebellions were easily crushed. (See MANITOBA.) While the first rebellion was being suppressed (1870), the province of Manitoba was organized and admitted into the Confederation. In 1871 British Columbia was admitted upon condition that a railway should be built to connect her with the Eastern provinces. The project was delayed for years, and one government was defeated as a result of the methods adopted in its promotion, but the promise was eventually fulfilled by the completion of the Canadian Pacific Railway in 1885. In 1873 the little island province of Prince Edward Island threw in its lot with the Dominion, but the ancient colony of Newfoundland still holds aloof.

In 1877, by the Halifax Fisheries Award, the United States agreed to pay $4,420,882 for the use of Canadian fisheries from 1870 (Treaty of Washington) to 1883. In the latter year, notice of its intention to terminate the agreement was given by the United States, and conditions reverted to the provisions of the Treaty of 1818. Considerable friction resulted in connection with the interpretation of the sections of that treaty and the power of the colonies to impose regulations upon American fishermen. After fruitless negotiations the question was settled by the award of The Hague Court (1910) on the points in dispute. (See ATLANTIC FISHERIES ARBITRATION.)

In 1893 the Bering Sea Dispute (q.v.) was settled, and in 1903 the disputed question relative to the boundary between Alaska and Canada was decided by the commission appointed for that purpose. (See ALASKA BOUNDARY DISPUTE.)

In 1887 the first Imperial Conference was held. At this and subsequent meetings matters of importance to the United Kingdom and her colonies were discussed. In 1905 Alberta and Saskatchewan (qq.v.) were separated from the Northwest Territories, and admitted as provinces. In 1908 the tercentenary of the foundation of Quebec was celebrated with great pomp, and a permanent memorial erected to General Wolfe. The Insurance and Currency Acts passed in 1910 were important events in internal legislative history.

Toward the end of 1910 an agreement was concluded between the American and Canadian Governments for the exchange of certain national products free of duty. The existing duties on a few manufactured commodities were also to be reduced. Early in 1911 this agreement was submitted to Parliament for approval, and was strongly opposed by the Conservative Opposition. On May 19, Parliament was adjourned to enable the Premier and some of his colleagues to attend the Imperial Conference in London. Following the adjournment, the agreement was ratified by Congress at a special session. Parliament resumed business on July 18, but the opposition to the measure was so great that the House was dissolved, and a general election called for September. A bitter struggle followed. Reciprocity was practically the sole issue before the people, although social and religious difficulties and jealousies were freely discussed by the more intolerant partisans. In the province of Quebec, too, the question was complicated by the Nationalists, who eventually united with the Conservatives in opposing the existing government. In general the Liberals urged upon the people the material advantages of reciprocity with the United States; the Conservatives, however, denied these, and denounced the agreement as dangerous to the political independence of Canada and a movement away from imperial federation. In the election the Liberal government was defeated, only 82 Liberals being returned out of a total membership of 221. Sir Robert Borden (q.v.) became Premier, and Sir Wilfrid Laurier (q.v.) assumed the position of leader of the opposition.

When war was declared between Great Britain and Germany, Conservatives and Liberals united in a declaration of loyalty to the Empire, while Sir Wilfrid Laurier pledged the support of his party to an active participation in the Government's efforts to aid the mother country and her allies. Early in 1917 Sir Robert Borden went to England for the purpose of discussing with the British Government important matters connected directly and indirectly with the war. Shortly after his return to Canada he announced that conscription would be adopted by his government, and put into force as soon as possible; and he invited Sir Wilfrid Laurier to join him in a Union Government committed to the policy of conscription, upon which policy an election should be held immediately. Sir Wilfrid refused the invitation unless and until the people should have declared their acceptance of the principle of conscription in a referendum based upon that principle alone, and uncomplicated by other issues. Sir Robert denied the necessity or desirability of a referendum, and invited other members of the Opposition to join him in the formation of a Union Government. Again he was unsuccessful, and thereupon decided to press his conscription bill through both Houses, which was accomplished in the face of intense opposition.

During 1918 the Union Government vigorously carried on its policy of bending all the resources of the country to the prosecution of the war, in this being enthusiastically supported by the great majority of the population. Among other measures taken was the registration in June of the whole population over sixteen years of age for war service in whatever line of work they would be most useful to the common cause, 5,246,703 persons being registered. The end of the war in November made it unnecessary to proceed with this scheme, and the Government and public at home turned their attention to the problems of demobilization and the return to peace-time conditions, while abroad the Government claimed for Canada, which had spent some $2,000,000,000 and sacrificed some 60,000 lives in the struggle, a voice in the terms of peace. This claim was conceded to Canada and the other Dominions (Australia, New Zealand and South Africa), as well as to India, so far as the Empire was concerned, and the claim was made good at the Peace Conference in Paris (q.v.), the Dominions securing effective representation, taking no inconsiderable part in the Conference, and finally signing the Treaty of Versailles. As a natural result they became in their own right members of the resulting League of Nations (q.v.), with their own representatives on its Council and Assembly, and at the first meeting of the latter at the end of 1920, Sir Geo. E. Foster, then Canadian Minister of Trade and Commerce, acted as a vice-president of the League. Thus, without any violent break with the past, Canada has secured through the League of Nations a voice in international affairs at least as powerful as Argentina or Brazil. Senator Dandurand, the representative of Canada, acted as President of the League of Nations Assembly in 1925. In September, 1927, Canada was elected to one of the nine non-permanent seats on the Council of the League and was represented on that Council in 1928 by her Prime Minister, Hon. W. L. Mackenzie King.

Internally, in 1919, Canada passed through a period of grave industrial unrest, due partly to demobilization and the consequent congestion of the labor market, partly to the still advancing commodity prices, and partly to the agitation of those who wished to overturn 'capitalism.' This unrest culminated in the Winnipeg strike, which cut that cosmopolitan community off from the rest of the world for several weeks, but finally collapsed on the display of force by the Government, several of the leaders being sentenced to terms of imprisonment. Industrial unrest throughout the country was, however, mitigated by the great business activity based upon advancing prices, and when prices began to fall about the middle of 1920, the community at large had had some time to adapt itself to normal conditions of peace-time. Particularly notable throughout 1919 and 1920 was the spending of nearly half a billion dollars in re-establishing the returned soldiers by war service gratuities, by vocational training, by loans to those desiring to go upon the land and by the provision of special governmental life insurance for these too often impaired lives (see RECONSTRUCTION).

The year 1921 was in Canada, as throughout the world, a period of grave depression, more especially in agriculture and in the mining of metals. The decline in the world price of wheat affected Canadian farmers disastrously and aroused their wrath against the existing Government, now led by Arthur Meighen, Sir Robert Borden having retired from the Premiership, about the middle of 1920, exhausted by the long strain of the war and reconstruction period. Many people, too, had been alienated from the Government because of its alleged arbitrary conduct during the war period, and the Liberals who had joined the Union Government in 1917 had mostly left its ranks. Taxation, too, was high and not too equitably distributed. Though Mr. Meighen might possibly have carried on for another session to complete the legal term of five years, he decided upon an appeal to the country. The election held on December 6 resulted as follows: Liberals elected, 118 (a bare majority); Progressives, 65; Conservatives, 50; Labor, 2. Total 235.

As the natural result of the election, Mr. W. L. Mackenzie King, the Liberal leader, was called upon to form a Ministry. After abortive negotiations with the Progressives for a coalition Government, he met Parliament, and in the first session, aided by a benevolent neutrality on the part of the Progressives, succeeded in maintaining his ground. To appease the latter, the Government re-established the Wheat Board for the marketing of grain and to some extent modified the customs tariff. Overtures along the lines of the 1911 reciprocity agreement were made to Washington, but up to the present these have been without effect.

The period between 1922 and 1925 was marked by comparatively few events of importance. Canada gained increasing recognition for her status in the world in 1922 by being represented at the International Economic Conference at Genoa and nearer home at the conference in Washington on the perpetuation of the Rush-Bagot treaty of 1818 keeping warships off the Great Lakes. In 1924 she staged a remarkable exhibition of her products at the British Empire Exhibition at Wembley, near London. A great strike in the coal mines of Nova Scotia in 1925 seriously affected the prosperity of that province. In the same year the United Church of Canada was formed by the merger of the Methodist, Congregational and the majority of the Presbyterian Churches of Canada.

The general election of 1925 was indecisive in its results, no one party having a clear majority of the seats in the House of Commons, though the Conservatives were the strongest single party. As the Progressives and Labor members were generally more friendly to the Liberal Government than to the Conservative Opposition, the Liberals held on to power and their decision was ratified by the majority of the House when Parliament opened. During the session, however, certain scandals in the customs administration were revealed, and the situation of the Government became more precarious. Finally, the Prime Minister advised the Governor-General to dissolve the House, but the Governor-General took the ground that the Conservatives should first have a chance to see whether they could carry on the administration. Mr. King thereupon resigned and the Conservative leader, Mr. Arthur Meighen, undertook to form an administration. However, his Government was defeated in the House almost immediately afterwards, and he asked the Governor-General for a dissolution of Parliament which was granted. This alleged partiality of the Governor-General to the Conservatives was an issue in the ensuing election of Sept. 14, 1926, and was probably largely responsible for the return of the Liberals to power. Almost immediately after taking office for the second time, Mr. King, together with his chief French-Canadian lieutenant, Mr. Lapointe, sailed for England to attend the Imperial Conference of October-November, 1926, which must rank as an important event in determining the status of Canada. At that Conference, the Committee on Interimperial Relations presented an epoch-making report on this subject, which was generally accepted as settling the outstanding issues. The relative positions of Great Britain and the Dominions are thus defined: —'*They are autonomous Communities within the British Empire, in no way subordinate one to another in any phase of their domestic or external affairs, though united by a common allegiance to the Crown, and freely associated as members of the British Commonwealth of Nations.*' It was also recommended that the Governor-General of a Dominion should be regarded as the personal representative of the Crown rather than as an official of the Government at London. Thus it became necessary for the Governments of Great Britain and Canada to be diplomatically represented in each other's capitals, and accordingly the British Government sent out Sir William Clark as its first High Commissioner to Canada, while Mr. Peter Larkin became High Commissioner of Canada in London. Further, Canada's right to have her own representatives at foreign capitals was recognized, and in February, 1927, Hon. C. Vincent Massey took up his duties as Canadian Minister in Washington, while the United States reciprocated by appointing Hon. William Phillips as its Minister in Ottawa. Subsequently an exchange of Ministers was arranged with France, and somewhat later with Japan, Hon. Philippe Roy becoming the first Minister of Canada in France, while Hon. H. M. Marler was designated as the first Canadian Minister to Japan.

In 1927, Canada celebrated the sixtieth anniversary of Confederation. The notes of the carillon which had been installed in the Victory Tower of the new Parliament Buildings, together with the addresses delivered on Parliament Hill, were transmitted by radio throughout the Dominion. The Prince of Wales and Prince George, together with Rt. Hon. Stanley Baldwin, the Prime Minister of Great Britain, visited Canada during the summer, and were enthusiastically received, among the ceremonies in which they took part being the opening of the International Peace Bridge, connecting Fort Erie, Ontario, with Buffalo, N. Y.

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Canada Balsam, a kind of turpentine obtained from the balsam fir (*Abies* or *Pinus balsamea*), a native of Canada and the northern parts of the United States (see FIR). It exists in vesicles between the bark and the wood, and is obtained by making incisions. It is a transparent, almost colorless liquid, having an agreeable odor and acrid taste, and solidifying occurs upon exposure to the air. Its component parts are essential oil, 24 parts; resin, soluble in boiling alcohol, 60; and resin, soluble only in ether, 16. Canada balsam is valued in the arts for a variety of purposes—as an ingredient in varnishes, in mounting objects for the microscope, and in photography. By opticians it is used as a cement, particularly for connecting the parts of achromatic lenses so that moisture and dust may be excluded; the value for such purposes is enhanced by perfect transparency and by great refractive power.

Canada Company, a company organized in 1825 by John Galt (q.v.), the Scottish novelist, who became its Canadian superintendent. Lands were purchased in the western peninsula of Ontario, the town of Guelph was laid out, large tracts of land were cleared, and hundreds of the best class of English and Scottish settlers were established. The company did not, however, make an immediate profit; its stock fell; Galt quarrelled with the lieutenant-governor and was superseded, but the company played a large part in the opening up and settlement of Ontario.

Canada, Literature of. See ENGLISH LITERATURE, *Canadian.*

Canada, United Church of, formed by the union of the Congregational Churches of Canada, the Methodist Church, the Presbyterian Church in Canada, and the Local Union Churches in Western Canada, themselves each the product of a series of unions. It was the culmination of a definite historical movement which arose (1) from the spiritual desire for the reunion of Christendom, (2) from the practical needs of a rapidly growing country whose population was scattered. The movement towards inter-denominational union began in 1885 and took definite shape in 1902, when the Methodist proposal for organic union of the Presbyterians, Methodists, and Congregationalists was taken up by each. A joint committee examined the questions involved and drew up a basis of union, which was eventually approved by the membership and the supreme bodies of the three churches. The doctrinal statement is a summary of their common faith: the polity is presbyterial, there being a General Council, territorial conferences, presbyteries, congregational sessions and boards. Only in the Presbyterian church was there serious opposition to the scheme, but after presbyteries and membership had twice given substantial majorities in favor, the General Assembly of 1916 resolved to consummate union. During the war controversy was dropped and by unanimous agreement Local Union Churches were formed in the West. In 1921 the necessary legislation was prepared, approved by the courts of the three negotiating churches and subsequently passed by the Provincial Legislatures and the Dominion Parliament. With the loss of a little over 30 per cent. of the membership and assets of the Presbyterian church, the union was consummated on June 10th, 1925. The United Church has since been admitted as a member of world wide Presbyterianism, Methodism and Congregationalism.

The work of amalgamation and expansion proceeded expeditiously. Twenty-six Boards and Committees became six. Five hundred and sixty congregations have already been merged into half their original number. Overlapping has been nearly eliminated, many Home Mission fields have become self-supporting and new territory has been occupied in new fields. Approximately 3,000 ordained ministers are in active work in Canada, where the church maintains 26 hospitals, 13 residential secondary schools, 3 Arts Colleges and 8 Theological Colleges. Foreign missionaries carry on work in Trinidad, Japan, Korea, Central India, Angola, West and North China. On Dec. 31st, 1928, the total number in full membership was 647,154; total under pastoral oversight, 1,486,384; total membership of Sunday schools, 634,432; total value of all local church property (exclusive of colleges, etc.), $88,375,729. The total raised for all purposes during 1928 was $16,713,663.

Canadian Northern Railway. See CANADA: *Railways.*

Canadian Pacific Railway. See CANADA: *Railways.*

Canadian Pondweed, a dark green perennial plant (*Anacharis alsinastrum*), of the natural order Hydrochardeæ, with long, slender, branched stems, and small, sessile, linear-oblong leaves. It grows submerged in rivers and ponds, so thickly as sometimes to impede navigation. The cir-

Canadian Pondweed

culation of cell protoplasm is well seen in its leaves under the microscope. The stem is brittle, and every piece broken off is capable of forming a new plant. It is a favorite plant for aquaria.

Canadian River, a tributary of the Arkansas River in the United States, rises in the northeastern part of New Mexico, and flows south and east for about 900 miles across the Panhandle of Texas and Oklahoma. It is of comparatively small volume, and is much influenced by the wet and dry seasons. About 35 miles west of its confluence with the Arkansas it is joined by the North Fork or Rio Mitria, its chief tributary (length, 600 miles), which follows a parallel course.

Canadum, a metal of the platinum group, discovered in 1911 by A. G. French in the Kootenay ores of Canada.

Canajoharie, kăn-*a*-jō-har'i, village, New York, in Montgomery County, on the Mohawk River, the Barge Canal, and the West Shore and New York Central Railroads; 45 miles northwest of Albany. Its principal industries are agriculture and dairying. It has manufactures of paper and cotton bags, canned beef, bacon, chewing gum, and candies. Pop. (1910) 2,273; (1920) 2,415.

Canal, an artificial channel filled with water. Though the name generally denotes a channel used for navigation, it is also applied to channels made for drainage and irrigation.

Canal Dover, now known as DOVER, town, Ohio, in Tuscarawas County, on the Tuscarawas River, the Ohio Canal, and the Baltimore and Ohio, and Pennsylvania Railroads; 52 miles northwest of Wheeling, W. Va. It has iron and steel works, and manufactures of roofing, tin, carriages, leather, and flour. Pop. (1910) 6,621; (1920) 8,101.

Canal, Drainage, an artificial watercourse formed to supplement rivers, where, owing to a deficiency of fall and the low level of the adjacent lands, they are inadequate for the discharge of the surplus rainfall in wet seasons, and the lands are exposed to floods. Many instances of such canals are found in Holland, and in the Fen districts of Lincolnshire and Norfolk, England. By embanking each side with the material excavated in forming the canal, and especially by placing these longitudinal embankments a little distance back from the edges of the cut, an enlarged channel is economically provided for the flood discharge, as soon as the water rises above the ordinary surface level, without exposing the land to inundation. See DRAINAGE.

Canalejas y Mendes, kä-nä-lā'hȧs ē mān'dȧs, JOSÉ (1850–1912), Spanish statesman, was born in Ferrol. He was educated at the University of Madrid and began public life with his election to the Cortes (1875), after which he served as sub-secretary to the presidency of the short-lived republic. He was again elected to the Cortes in 1880, and acted as Minister of Public Works and of Justice in several Liberal Cabinets from 1882 to 1890. In 1897 he visited the United States and Cuba, to investigate conditions that were causing strained relations between Spain and the United States; and his assurances of reforms in Cuba helped to mitigate anti-Spanish sentiment in the United States. In 1898, dissatisfied with the conduct of the Spanish-American War, he broke with the Liberal Party, and helped to form the Radical Party, of which he was made leader. He became Minister of Agriculture (1902), President of the Cortes (1906), and Premier of Spain (1910). He was assassinated on Nov. 12, 1912, by an anarchist. Canalejas was assiduous in the work of social reform, and a recognized authority on all branches of social and industrial legislation. His talent as an orator procured him many triumphs.

Canaletto, kä-nä-let'tō, ANTONIO (1697–1768), properly ANTONIO CANALÉ, the great architectural painter of Venice in the eighteenth century, was born in Venice. In 1764 he visited London, and painted several picturesque English views. He possessed the power of reproducing what he saw with an accuracy almost photographic. He was a master of perspective, his touch being firm and certain; while his best work is distinguished by broad simplicity of effect, clearness of tone, and occasional brilliancy of sunlight, his usual tone is chastened and subdued. Examples of his work are found throughout Europe and in Great Britain.

Canaletto, BERNARDO BELLOTTO, called CANALETTO THE YOUNGER (1724–80), Italian painter and engraver, was born in Venice. After studying under his uncle, Antonio Canaletto (q.v.), whom all his life he imitated both in tone and treatment, he visited Rome, Verona, Brescia, Milan, Dresden, and England, where he painted an interior of King's College Chapel, Cambridge. His pictures are chiefly remarkable for correctness of perspective and subtle effects of light and shade. Many of them are in the Dresden Gallery.

Canal, Grand. See GRAND CANAL.

Canal, Irrigation, a canal whose object is to lead the waters of a river, flowing through a dry country, on to lands at a distance from the river bank, and so increase their fertility. Considerable tracts of the Lower Nile valley and the rice crops of India are largely dependent upon the supply of water conveyed by irrigation canals; and important irrigation works have been carried out in Italy and Spain, as also in California, Colorado and other arid regions. These canals are made with a regular fall or slope. By increasing the fall, the size of the channel may be proportionately reduced for a given discharge; but it is inexpedient to augment the fall, even if practicable, beyond the limit at which the increased velocity of flow thereby induced begins to scour the bed of the channel—as occurred on the Ganges Canal, necessitating works for checking the flow.

Sluices and weirs for regulating the supply are constructed at the intakes of these canals, and arrangements are provided for the admission of the water into the branch canals and trenches which serve to distribute the water over the area to be irrigated. The formulas for determining the flow, and consequently the requisite section of a drainage or irrigation canal with a given available fall, form a branch of hydromechanics. See IRRIGATION.

Canal, Navigation, a level still-water channel solely constructed as a waterway. These canals may be classified under two divisions: (1) ordinary inland navigation canals, admitting smaller craft, known as *Barge Canals;* and (2) *Ship Canals*, providing a means of less expensive transportation between ocean and ocean, or between the ocean and some inland centre.

Construction.—In building canals the following two main points must be determined on: the cross section of the canal; the longitudinal profile. Upon the best determination of those two points depend, in a still higher degree than in railroad work, the cost, capacity, and time for finishing the canal.

The channel is generally formed with a flat bottom and sloping sides, which in some situations have a stonework 'pitching.' The breadth at the bottom should be more than twice that of the largest boats or barges which are to navigate the canal; the depth should be at least 1½ feet greater than the draught of the loaded boats. The embankments are from 2 to 3 feet above the level of the water, and from 4 to 6 feet in width; each embankment should have a vertical puddle wall in its centre from 2 to 3 feet thick. Where the soil is not retentive, the bottom and sides of the canal should be puddled with clay, tempered and well mixed with sand and gravel. This prevents the percolation of water and the burrowing of animals. The angle of slope depends entirely on the nature of the ground. In soft ground the angle is flat; in rock, the sides are made almost vertical. Through towns vertical side walls are constructed to save space and provide quays. In tunnels and deep cuttings the width is usually made only just sufficient for a single barge; and passing places are formed at intervals. A towing path along one side of the canal, raised about 2 feet above the water level, affords facilities for haulage.

Canals generally consist of a number of different sections or reaches, each on one level, but differing from each other in height. By means of locks, inclines, or lifts, boats are transferred from one level to another.

The *Lock*, placed at the termination of the lower level, is a water-tight enclosure of masonry of sufficient dimensions to contain the largest barges or vessels that navigate the canal. Each end is closed by heavy swinging gates, which open in the middle against the direction of the current. As the double gates are somewhat wider than the lock, they meet before they form a straight line, and are forced firmly together by the pressure of the water against them. *Sluices*, which are controlled from above, are inserted in the gates near the bottom, and when opened allow the passage of water, though the gates remain shut.

When a boat, in ascending a canal, arrives at a lock, the upper gates are first closed, then the lower ones opened to allow the boat to enter, and when it has entered are closed behind it. Water is allowed to flow through the sluices in the upper gates, and sometimes also a side culvert discharges from the upper level into the lock. As the lock fills the water level rises to that of the upper reach; whereupon the upper gates can be opened, so that the boat can pass out of the lock on the higher level. The lift of a single lock ranges from 2 to 12 feet, and is commonly 8 or 9 feet.

Incline.—Occasionally, where water is scarce, and the lift large, vessels are conveyed on an incline from one reach to the next, in a special carriage running on rails laid on the incline, and controlled by a cable. The vessel is either lifted on a cradle out of the water, or it is floated into a wrought-iron caisson or trough, containing water, with lifting gates at each end, and supported on a frame so constructed that the caisson is conveyed in a horizontal position up or down the incline. Primitive inclines were employed on the ancient canals of China, the boats being hauled up by a capstan, and made to slide down the paved track.

Caissons were first adopted for inclines on the Chard Canal, in Somersetshire, England, and, on a larger scale, on the Monkland Canal, near Glasgow, Scotland.

Lift.—The lift or elevator (inclined or vertical) is also employed on some canals. The inclined elevator consists of two counterbalancing troughs or caissons, each holding enough water to float a boat. Two lines of rails are employed, one caisson running on each line of rails; and the caissons are so connected by ropes or chains running on guide pulleys that when one ascends, the other descends. The vertical elevator, instead of a series of regular locks, may in many cases be useful, as in a few minutes it lifts the barge to the same height it would take hours to reach by means of regular locks.

According to the system employed—*viz.*, regular hydraulic piston, or hydraulic balance—the water consumed for every lift will vary only a trifle, as the main part of the water in the caissons remains the same when travelling up and down. The last point is in many cases of the greatest importance where the water supply is limited, or where water has to be pumped up to the summit of the canal to keep water on the right level.

Hydraulic canal lifts have been in use for some years, the first having been opened in 1875, at Anderton, England. Another similar lift has been erected at Les Fontinettes, near St. Omer, on the Neufossé Canal, with a lift of 43 feet, in substitution for a flight of five locks which had become inadequate for the large barge traffic from Boulogne, Calais, and Dunkirk to Paris. In the United States the five locks at Lockport, N. Y., on the Erie Canal were replaced by an elevator in 1895. One of the highest hydraulic lift locks in the world is located on the Trent Canal, at Peterborough, Ontario.

There is no difficulty in the supply of water to canals in low-lying districts, such as Holland and parts of Belgium; and even in most parts of river valleys streams are generally available for introducing a supply at various points. When, however, a canal rises to the higher portions of a river basin, and crosses the ridge separating two adjacent basins, in a reach called the summit level of the canal—a common course for inland canals—it is sometimes difficult to secure an adequate supply, especially for the summit level; so that occasionally an artificial reservoir has to be formed, at a high level, by constructing a dam across the valley of a mountain stream.

Historical.—The great advantage of the canal was recognized in ancient times, and remains and accounts of old canals in Egypt, Babylonia, Persia, India, China, Greece, Italy, and other countries are numerous. The Grand Canal (q.v.) of China is world famous.

Among important canals of the Old World are the famous *Suez Canal*, connecting the Mediterranean and Red Seas; the *North Sea and Baltic Canal*, known as the Kaiser Wilhelm or Kiel Canal, which begins at the dockyard in Kiel, on the Baltic, and enters the Elbe near Brunsbüttel, 15 miles above the North Sea; and the *Teltow Canal*, beginning near Potsdam and ending in Berlin. The *Amsterdam Ship Canal*, improving the access to Amsterdam, extends westward to the North Sea, reducing the distance to about 17 miles, instead of the 50 miles by the old North Sea Canal, thus enabling much larger vessels than formerly to enter the port. The *Corinth Canal*, cutting through the Isthmus of Corinth, saves two days in the voyage from the Adriatic to the Ægean Sea. The *Kronstadt* or *Pontileff Canal*, 18½ miles long, connects Kronstadt with Leningrad. (See articles on SUEZ CANAL; KAISER WILHELM CANAL; CORINTH, ISTHMUS OF.)

Probably the earliest known canals in England were the Foss Dyke still navigable, and Caer Dyke, in Lincolnshire, 11 and 40 miles long, constructed by the Romans, and improved in the twelfth century; but the opening of the Aire and Calder Navigation, toward the close of the seventeenth century, was the first important step in inland navigation.

The largest canals of Great Britain are the Gloucester and Berkeley Canal, with a depth of 15 feet, enabling vessels of 600 tons to go from Sharpness to Gloucester, 17 miles; the Aire and Calder Navigation, 9 feet deep, on which steam towage with a train of barges has been successfully carried out; the Caledonian Canal, with a depth of 17 feet, which crosses Scotland and affords a passage for vessels of 300 tons; the Crinan Canal, 12 feet deep, across the peninsula of Kintyre, providing a short cut for vessels of 160 tons; and the Forth and Clyde Canal, with a depth of 10 feet. The formation of a ship canal between the Forth and Clyde has frequently been suggested, and in 1909 and later the project was actively discussed in

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CANADA IN THE GREAT WAR

Effects of the War in General.—The year 1914 opened inauspiciously for Canada. The land boom in the West, and in the East too, had collapsed. Many people held more land than they could pay for, or even pay the taxes on. Many farmers had more land than they could cultivate, or ever intended to cultivate; others had settled in areas not well adapted for cultivation; interest rates were high, and it was difficult to obtain credit—difficult for individuals, corporations and municipalities. In the East, production was curtailed, the banks were restricting their loans, many people were out of work and could not obtain employment, and corporations were anticipating the passing of their dividends.

For a time, most of these evils were accentuated by the outbreak of the Great War (see EUROPE, GREAT WAR OF). Numerous industries suspended or curtailed operations, and no one could say what the day or the year would bring forth. Then the outlook began to clear. In the West, the acreage of field crops was less than in any year since 1910, and could not be increased after the outbreak of the war. The wheat crop was only 161,280,000 bushels, but the average quality was better than for previous years; while the highest price ($1.22 a bushel) for a decade was reported at the close of the year. The value of all field crops was $638,580,300, as compared with $552,771,500 in 1913.

In 1915 the flood of war orders began to pour in on the Eastern manufacturers, while the opportunity for enlistment proved a boon for men who were out of work. This was particularly true during the closing months of 1914, and for the West, where the first contingent was largely recruited. It has been estimated that $600,000,000 of war orders have been placed in Canada, and the profits obtained have been enormous. The cost of manufacturing an eighteen-pound shrapnel shell amounted to $1.91 for one concern, while the price received was $4.15. On the other hand, there have been instances of loss of capital and custom as a result of attempts to embark upon a new and untried line of production. For this and other reasons it was perhaps necessary to offer the stimulus of excessive gain in the early stages of the new enterprise.

Profits are not so excessive now (March, 1916), but it is safe to conclude that in many cases they amount to 100 per cent. New capital was obtained, plants were enlarged, and many manufacturers of other commodities turned their attention to the production of munitions. Of course, this sort of prosperity will last only as long as the war lasts, and the day of reckoning must come—the day when Canada must think of the interest charge on her increasing indebtedness, and the day when industry must once more be adjusted to meet the normal demands of peace.

Particular attention was directed, both in the East and the West, to the encouragement of agriculture and the preparation of new land for cultivation. The result has been the largest harvest in the history of the country. The yield of the most important field crops is shown in the following table:

	1914.	1915.
	Bushels.	Bushels.
Wheat.....	161,280,000	336,258,000
Oats.......	313,078,000	481,035,500
Barley.....	36,201,000	50,868,000
Buckwheat.	8,626,000	8,101,000
Flax.......	7,175,200	12,604,700
Corn.......	13,924,000	14,594,000
	Tons.	Tons.
Hay, clover	10,259,000	10,953,000

The amount of wheat available for export is estimated at 228,132,200 bushels. Prices have been excellent, although there has been considerable fluctuation.

During 1915 there was practically no lack of employment for those who sought work. At the same time, there was considerable suffering in some of the cities, and many railway employees were dismissed during the first part of the year as a result of the diminution in railway earnings. This unfortunate state of affairs has been remedied to a great extent by a marked increase in railway receipts, resulting from the movement of the large wheat crop of the West. For the most part, the relations between capital and labor have been surprisingly harmonious, and there has been a marked absence of friction between employers and employed. This is the more remarkable when the huge profits of many of the manufacturing concerns are considered; but then Canadian labor is not well organized, and not very active in obtaining its rights; in this respect showing a marked contrast to English labor under similar conditions. During 1914 the membership of the Canadian trade unions actually diminished—from 175,799 for the previous year to 166,163; though this is explained, in part, by enlistments.

The construction of new buildings has been adversely affected, particularly during 1915. The value of the building permits issued during the eleven months ending November, 1915, was only $30,419,393, as compared with $97,236,334 for the same period of the preceding year.

The Dominion Government obtained Parliamentary sanction to provide for the 'postponement of all or any debts, liabilities, and obligations however arising,' but fortunately made no use of the power. On the other hand, the governments of Manitoba, Saskatchewan, and Alberta provided for partial moratoria, principally applicable to land payments.

Immigration has diminished perceptibly as a result of the war. This is shown by the following immigration figures for the fiscal years preceding the war and for the fiscal year 1914–15:

	British.	American.	Foreign.	Total.
Year ending March 31, 1913..	150,542	139,009	112,881	402,432
Year ending March 31, 1914..	142,622	107,530	134,726	384,878
Year ending March 31, 1915..	43,276	59,779	41,734	144,789

Most Canadians anticipate a great increase in immigration at the close of the war; but there seems considerable doubt whether their prophecies will be realized when we consider the depletion of the labor forces of Europe and the great demand for labor which peace will bring. In addition, Canada is now a very expensive country to live in; taxes are exceedingly heavy, and will be much heavier when she begins to pay the interest on her prospective war debt. Furthermore, the burden of a protective tariff has been increased by the addition of new duties.

These and other causes have been instrumental in producing a further rise in prices. The index numbers, compiled by the Department of Labor, are obtained from the wholesale prices of 272 commodities, and, like the American index numbers, are compared with the prices for the base period 1890–1899 inclusive—the average for that period being 100. These index numbers are as follows: 1911, 127.4; 1912, 134.4; 1913, 135.5; 1914, 136.1.

They are not yet available for the complete year 1915, but are known for eleven months; they are as follows, and speak for themselves: January, 138.6; February, 143.8; March, 145.9; April, 147.0; May, 147.6; June, 147.3; July, 147.1; August, 147.6; September, 147.2; October, 148.8; November, 157.8.

Public Finance. — During the fiscal year ending March 31, 1914, the total consolidated fund receipts of the Dominion Government amounted to $163,174,395; the disbursements for the same period were $186,241,048; leaving a nominal deficit of $23,066,653. It is only fair to add that a considerable portion of the expenditure ($37,180,176 in all) is chargeable to capital, apparently for the reason that it will ultimately be wholly or partially productive. When the special war session of Parliament was summoned in August, 1914, the Government was confronted by increasing expenditures, largely for war purposes, and by a diminishing revenue, due to the falling off in imports.

Before the war the anticipated revenue for the fiscal year 1914–15 had been estimated at $145,000,000, with an expenditure of $175,000,000, the balance to be made good in the usual fashion by borrowing in London. In anticipation of a further decrease in revenue and increase in expenditure, the import and excise duties on a variety of commodities were increased, the principal articles affected being coffee, sugar, spirits, malt liquors, and tobacco. In all cases where both import and excise taxes were increased upon the same commodity, the Government, true to its protective policy, imposed import duties considerably in excess of the excise. It was anticipated that these new duties would yield a revenue of $15,000,000 for a full year.

In January, 1915, the regular session of Parliament was held, and the budget speech was delivered on Feb. 11. For the fiscal year ending March 31 the Minister of Finance anticipated that the receipts would be $130,000,000; consolidated fund expenditure, $140,000,000; capital and other expenditure, $50,000,000; war expenditure, $50,000,000; resulting in a deficit of $110,000,000 to be met by loans—a deplorable presentation of the country's finances, and a state of affairs calling for a radical increase in taxation. As a matter of fact, the revenue for the fiscal year 1914–15 was $133,073,482; expenditure on consolidated fund, $135,523,207; capital expenditure, $41,447,320; total expenditure, including war expenditure, $248,098,526.

In order to meet the still larger deficit anticipated for the succeeding fiscal year, the Minister of Finance proposed, as the principal revenue measure, an increase in the customs duties upon nearly all commodities imported into Canada. The increase adopted was 7½ per cent. *ad valorem* to the general and intermediate tariffs, and 5 per cent. to the British preferential tariff; and it was imposed also on most goods which had formerly been admitted free of duty. The most important commodities to which the increase does not apply are wheat, flour, anthracite coal, tea, fish from Newfoundland, fishermen's supplies, and certain agricultural implements. Finally, the manufacturers were favored by a provision that a drawback of 99 per cent. should be returned on all duties paid upon imported materials used in articles further manufactured in Canada and exported therefrom.

In addition, the following direct taxes were imposed: (1) ¼ of 1 per cent. on bank notes; (2) 1 per cent. on gross incomes of loan and trust companies; (3) 1 per cent. on premiums of insurance companies other than life, fraternal, benefit, and marine; (4) 1 cent each on telegraph and cable despatches; (5) on railway and steamship tickets, 5 cents for a ticket costing more than $1 and not more than $5, and 5 cents for each $5 in value; (6) 10 cents on railway berth tickets, and 5 cents on railway chair car tickets; (7) on tickets carrying passengers outside Canada, Newfoundland, the United States, or the British West Indies, $1 for a ticket costing over $10, $3 for a ticket costing more than $40, and $5 for a ticket costing more than $65; (8) 2 cent stamp tax on checks, bills of exchange, bank receipts, express money orders, post office money orders, and 1 cent on postal notes; (9) 1 cent additional on each letter or post card posted in Canada; (10) 1 cent stamp tax for each 25 cents in value of proprietary and patent medicines and perfumery; (11) 3 cents a pint and 5 cents a quart on non-sparkling wines in bottles or packages; (12) 13 cents a half pint and 25 cents a pint on sparkling wines.

The Minister of Finance considered that the old taxes would produce a revenue of $120,000,000, which would be increased to $150,000,000 or $155,000,000 with the new taxes. The anticipated expenditures on consolidated fund are $140,000,000; capital and other special expenditures, $40,000,000; war, $100,000,000; investments authorized by statute, $4,000,000; outstanding treasury bills, $15,000,000; giving a total expenditure of about $300,000,000. In the budget speech delivered on Feb. 15, 1916, the Minister stated that the revenue for 1915–16 would be $170,000,000; consolidated fund expenditure, $125,000,000; capital expenditure, $46,000,000; and war expenditure, $100,000,000.

The proposal for an income tax was dismissed with the comment that two provinces and many municipalities already made use of income taxes, and that in any case the gross yield would not exceed $2,000,000. This latter statement is, of course, absurd, and the first statement, though true, is no reason why the Dominion Government should not do likewise. It seems probable that the Government must eventually come to an income tax, in any real attempt to meet ordinary expenditure, to say nothing of the vast sums necessary for arming, equipping, and maintaining an army of 500,000 men. The increase in import duties serves only to restrict imports and protect the home manufacturer, while the direct taxes are but a makeshift. A Dominion income tax, however, will provoke strenuous opposition from the classes and the manufacturers.

On Feb. 15, 1916, the Minister of Finance announced an increase in the duties on apples and oil, presumably for protective purposes. He also announced a tax of 25 per cent. on the amount by which the net profits, since Aug. 4, 1914, have exceeded, in the case of corporations, 7 per cent. of the paid-up capital, and in the case of persons and partnerships, 10 per cent. of the paid-up capital. This tax is not applicable to any business with a capital of less than $50,000, unless it is engaged in the production of war materials; nor does it apply to life insurance companies, farming, or stock raising. Foreign companies operating in Canada receive special treatment, being taxed in proportion to the capital in use in the Dominion.

In order to bridge the enormous and growing gap between an increasing expenditure and a diminishing revenue, the Dominion Government during the fiscal year 1914–15 resorted to extensive borrowing. We must include in this category the over-issue of Dominion notes to the value of

$26,000,000. This transaction is in the nature of a forced loan on which no interest is paid, and carries along with it all the undesirable peculiarities which may accompany an emission of irredeemable paper money. In addition, $60,000,000 was borrowed from the English Government, being that part of the English domestic loan allocated to Canada; $5,000,000 was borrowed from the Bank of Montreal; treasury bills were floated to the value of $15,000,000; and $6,500,000 worth of 1940–60 stock was sold.

With the virtual closing of the London loan market the Dominion Government was compelled during 1915 to turn to the New York and domestic markets. In July, $45,000,000 worth of one and two year Dominion notes were sold in New York. These notes will be due on Aug. 1, 1916 and 1917. In November a domestic war loan of $50,000,000 was announced, and within a few days it was subscribed and doubly subscribed, the Government ultimately deciding to increase it to $100,000,000. This is the first time that a loan of this description has been negotiated in Canada, and the ready and prompt response from the people shows how their wealth has increased. It is not improbable that the Government will decide to repeat the experiment before the war is over.

The net debt of the Dominion Government on March 31, 1914, was $335,996,850, and on the same date in 1915 it was $449,376,083. On Dec. 31, 1915, it was $515,144,019—an increase of $179,147,169 since March, 1914. Of this increase in net indebtedness, the war has probably not been responsible for more than $150,000,000, the rest being due to the difference between consolidated revenue and the ordinary expenses of the government.

Trade.—For some years before the war, Canadians had been borrowing freely in the London market for government, municipal, and corporation purposes. The credits so obtained had for the most part been used in buying supplies in the United States, with the result that Canada's imports were greatly in excess of her exports, as the loans floated in any one year were greater than the interest on loans previously floated. Of course, this meant a so-called unfavorable balance of trade, an expression in itself unfortunate if the credits so obtained are used for desirable and productive purposes, and are economically spent. The effect of this borrowing is shown in the great and increasing preponderance of imports over exports in the years immediately preceding the outbreak of hostilities. The figures for imports and exports of merchandise for the twelve months ending Aug. 31 were as follows:

	Imports.	Exports.
1910.....	$409,475,853	$304,941,801
1911.....	474,321,785	293,772,274
1912.....	584,309,568	338,460,185
1913.....	686,492,266	395,879,372
1914.....	549,626,474	468,537,872

One result of the war was an immediate and well-nigh complete stoppage in the London source of supply, with the result that imports diminished very rapidly, and the revenue derived from duties on imports suffered in proportion. For the year ending Aug. 31, 1915, the value of imports was $415,813,055. On the other hand, exports increased in value as a result of the demand abroad for products of all kinds, including munitions of war. In addition, the prices obtained in England and Continental countries were higher than had prevailed before the war. The value of the exports for the twelve months ending Aug. 31, 1915, was $504,810,452. Later figures show that the value of the exports has increased very materially over the figures last quoted. It cannot be otherwise when we remember that Canada has just marketed the largest wheat crop in her history, and that the production and exportation of war supplies of all kinds are steadily increasing. For the nine months ending Dec. 31, 1914 and 1915, the values of the exports and imports of domestic merchandise were as follows: exports—1914, $306,823,039; 1915, $511,534,042; imports—1914, $348,746,920; 1915, $343,923,323. For December alone they were: exports—1914, $37,193,609; 1915, $92,171,402; imports—1914, $30,392,913; 1915, $45,690,721.

There is little doubt that for some years preceding the war, the Dominion Government, the provincial governments, and many of the industrial and transportation corporations had been borrowing in London far too freely, and that the credits so obtained had often been spent injudiciously. The war effectively put an end to this. Since then the great and growing preponderance of exports over imports is enabling the country to pay the interest on loans previously floated; and as this is the normal state of affairs for a new and growing country, the war, in this respect, has proved a desirable though harsh corrective to national extravagance.

Banking Changes.—As a result of the close connection between the Dominion Government and the chartered banks, as well as the fact that a large part of the circulating medium is composed of Dominion notes, no account of the effect of the war upon the banks is complete without some reference to the changes which have resulted in the provisions governing the issue of Dominion notes. At the outbreak of the war the value of the Dominion notes in circulation was $112,793,833. The larger part of this issue ($90,588,065) was held by the banks, and was used by them in liquidating obligations due each other; the rest were in possession of the public. Against the total issue the Government was bound to maintain a gold reserve according to the following conditions: 25 per cent. in gold of the first $30,000,000, and dollar for dollar in gold against the issue in excess of $30,000,000. This necessitated a gold reserve of $90,293,833. As a matter of fact, the gold reserve on July 31, 1914, was $91,735,584.

When Austria declared war on Servia the stock exchanges in Montreal, Toronto, and other Canadian cities were immediately closed, and a financial crisis seemed imminent. On Aug. 3, a proclamation was made by order-in-council that Dominion notes should no longer be redeemable in gold. Sir Thomas White, the Minister of Finance, explained that this was necessary in order to protect the gold reserve of the Dominion Government. He also announced that Dominion notes would be advanced to the banks upon the deposit by them of approved securities with the Government. Previously these notes had been obtainable only upon the deposit of gold. The notes advanced against securities were repayable not later than May 15, with interest at 5 per cent. Advantage was taken of this privilege by a few of the banks, and on Jan. 31, 1915, it was announced that the amount then outstanding was $7,900,000 out of a total of $14,400,000; but there is some doubt concerning the reliability of these figures.

Parliament assembled on Aug. 18, and shortly afterward the Minister of Finance introduced a bill providing that the partially covered issue of Dominion notes should be increased from $30,000,000 to $50,000,000. This bill passed both Houses of Parliament with little or no adverse criticism, and received the royal assent on Aug. 22. It was clearly understood at the time that this was not solely or peculiarly a war provision, and that it would be continued after the conclusion of hostilities.

On March 26, 1915, Sir Thomas White made a further announcement to the effect that there had been an over-issue of Dominion notes to the value of $26,000,000. This was caused by the issue of $10,000,000 to the

Canadian Northern Railway, $6,000,000 to the Grand Trunk Pacific Railway, and $10,000,000 for general Government purposes. The reason given was the impossibility of raising a loan in the London market. In the case of the advance to the railways it was argued that since the interest on their bonds was guaranteed to a large extent by the Government, and since they, too, could borrow no more in the world's market, it was necessary for the Government to adopt the alternative of a forced loan of the nature described. Again the Liberal Opposition remained silent, perhaps remembering that in 1907 they had adopted the like unfortunate expedient for the purpose of helping the banks to move the crops from the West. On Dec. 31, 1915, the value of the Dominion notes in circulation and held by the banks was $172,010,114; the gold reserve held against them on the same date was of the value of $108,020,156, the excess issue being $26,489,958 worth of notes.

At the outbreak of the war the banks were authorized by order-in-council to pay in their own notes. This does not mean that bank notes were made legal tender between individuals, but only from the banks to their customers. When Parliament met in August this order was regularized, and at the same time the banks were empowered to emit an excess issue of notes not in excess of 15 per cent. of a sum equal to the unimpaired paid-up capital and rest fund of each bank, such excess issue to be subject to a tax of 5 per cent. As the banks had before been granted this privilege during the six months from Sept. 1 to Feb. 28, the result was an extension of the power to cover the whole of the year. In addition, the banks had been permitted in 1913 to issue notes dollar for dollar against gold or Dominion notes deposited in the central gold reserve; and as this issue is not subject to the 5-per-cent. tax, the banks have availed themselves freely of the privilege. The result of these various enactments is that in Canada to-day, as in Continental Europe, there is absolute suspension of specie payments. But as the average Canadian never uses gold in exchange, he is not disturbed by his inability to obtain gold, although the trader is hampered in no longer being able to use Dominion notes as gold certificates in the American trade.

Upon the whole, the banks stood the strain very well; and they could hardly have fared ill, considering their favorable treatment by the Government, and the fact that they have made and are making full use of the power to refuse gold to their creditors. In addition, they found their New York call loans a very efficient help when the storm burst. The following figures will convey some idea of the standing of the banks before and during the war:

	Dec. 31, 1913.	Dec. 31, 1914.	Oct. 30, 1915.
Notes in circulation..........	$108,646,425	$105,969,755	$122,782,233
Total liabilities..............	1,308,756,866	1,314,646,254	1,413,362,832
Dominion notes held.........	104,778,358	138,040,382	136,223,275
Gold and other coin..........	45,423,463	62,566,684	61,724,773
Total assets..................	1,551,263,432	1,555,556,815	1,657,256,962

Army and Navy.—On Aug. 1, 1914, when war seemed unavoidable, the Canadian Government offered the English Government an expeditionary force in case England should become involved. Since the militia can be placed on active service abroad only for the defence of Canada, it was decided that volunteers should be asked for. On Aug. 6 the offer was accepted, and the troops were to be sent over as soon as possible. The English reservists were sent home for service, the *Rainbow* and the *Niobe* were placed at the disposal of the Admiralty, and the Naval Volunteer Force was called out for active service. Steps had already been taken in 1913 and early in 1914 to provide for the organization of the different government departments on a war footing, and this was now done. Two submarines, which had been partially constructed and afterward assembled in Seattle for the Chilean Government, were purchased by the Dominion Government, at the request of the government of British Columbia, were removed to Esquimault, and turned over to the Admiralty. Multitudinous orders-in-council were passed, dealing with enemy ships in Canadian waters, trading with the enemy, German and Austrian subjects in Canada, the establishment of prize courts, etc.

At the same time the Department of Militia was engaged in the more onerous and important work of recruiting and training the men of the first contingent. Following upon the preliminary work of enlistment, the volunteers were eventually assembled in a great training camp at Val Cartier, near the city of Quebec, where several weeks were spent. Toward the end of September they left for England, sailing from Quebec in a great fleet of 32 transports, which was met at Gaspé by a convoy of 10 men-of-war and escorted by them across the Atlantic to Plymouth. The winter camp in England was on Salisbury Plain, and there the men of the first contingent were prepared for the life in the trenches of Belgium and France.

With the departure of the first contingent, and even before, the business of recruiting gained in impetus. During the winter months the volunteers receive their provisional training in various camps in or near the cities and towns, since Val Cartier is not habitable during the cold weather. Some battalions, indeed, do not receive any training there, but go forward directly to England. It is now customary also to send the men over a battalion or two at a time, the transport or transports being met on the other side by cruisers or torpedo-boat destroyers.

The announcement was made in Parliament on April 10, 1915, that up to that time the total overseas forces, either abroad or organized at home, numbered 89,353. Of this number, 35,320 were in the first contingent which had crossed the ocean in a body; 22,272 were in the second contingent; 27,079 were in the reserves; 3,500 had been recruited but not mobilized; and 1,082 were doing garrison duty in Bermuda and St. Lucia. In addition, the active militia and permanent force numbered 12,207, making a total of 101,560. Since April and up to the end of 1915, 80,250 men have been sent to England. Of the total number, about 50,000 have been or are at the front. It should be remembered that Canada is meeting all the expenses of her forces both at home and abroad. At the present session of Parliament the Premier announced the Government's authorization for the establishment of a Canadian army of 500,000, including those who have already gone forward to England and the Continent. As it costs the Government about $1,000 a year for each soldier, this means a tremendous undertaking for seven or eight million people. But there is no hesitation, no stopping to count the cost.

The demands upon the generosity of the people are constant and pressing. They have voluntarily taken upon themselves the charge of adding to the comforts of the dependents of those at the front, so that no one shall know what want means while father, husband, or son is doing his duty. When the Patriotic Fund began to show signs of depletion it was decided that a further appeal should be made to the people. This was done in January, 1916. City after city, town after town, and village after village exceeded its quota, and more than $15,000,000 was raised in a few days.

Insert in Volume II following page 483 M

The Canadian Political Situation and General Elections—1926

In the early summer of 1925 it became evident to observers throughout Canada that the Liberal government of W. L. Mackenzie King, which had taken office at the end of 1921, after the decisive defeat of the Conservative administration of Arthur Meighen, was contemplating an appeal to the electors. Throughout the four years since 1921 the Liberals, though with only a bare majority (they numbered 118 in a house of 235), had received a general support, especially in tariff questions, from the 65 Progressives and 2 Labor members, as against the remaining 50 Conservatives of the official opposition, the high-tariff party of Canada. Few as were these Conservatives, they were encouraged by the feeling that the prevailing stagnation in industry and the consequent unemployment would strengthen their hands in the coming conflict, and in June 1925 they nailed their colors to the mast by introducing a resolution calling for higher protection to all Canadian industries. Though defeated in the House of Commons by an enormous majority of 174 votes to 37, they determined to carry the issue before the electors as soon as the opportunity was afforded.

The Conservatives had not long to wait, for Premier King, who might have postponed the election until 1926, decided to take the chances of an election in the autumn rather than wait until the full legal term of Parliament expired. On Sept. 5, 1925, he announced his decision at a speech in his own constituency, fixing the date of the election for Oct. 29, and laying stress on the economy of his administration, the tariff reductions which had benefited consumers and producers, the increase in the British preference, the reductions in the income tax, and the need for Senate reform. The Conservatives, on their side, drew attention to the depression, the closing of factories, and the exodus of workmen to the United States; the leaders of both the old parties carrying the campaign from the Atlantic to the Pacific. The result of the election was in large measure to justify the confidence of the Conservatives, for they more than doubled their numbers, securing 116 seats in a house of 245—10 members had been added as a result of the redistribution after the census of 1921—while the Liberals numbered only 101 and the Progressives 25. There were also 2 Labor members and one Independent. While no party had a clear majority, the Conservatives were the strongest single aggregation, and the Liberal prime minister and eight of his colleagues in the cabinet had been defeated in their own constituencies.

As a result of the election a difficult constitutional question now presented itself. What was the will of the people and who should hold the executive power? Hitherto, under the two-party system, every Canadian government had had a clear majority of supporters in the House of Commons, presumably representing a majority of the voters. Now no party had a majority. While the Conservatives, as the strongest single party, claimed the right of forming a government, the Liberals, already in possession and relying upon the continuance of the general support which the Progressives had given them in the previous Parliament, held on to the reins of power, claiming that it was for Parliament to decide whether or not they should give place to their opponents. In this the Governor-General acquiesced, on condition that only routine matters should be dealt with by the government until the will of Parliament had been expressed.

Parliament met as early as possible (Jan. 7, 1926), and a long and bitter debate ended in a vote of confidence in the Liberal administration, the Progressives being strongly opposed to the high tariff tendencies of the Conservatives. Next, the prime minister found a safe seat in Saskatchewan, and proceeded to carry on the government. The solidity of the Conservative Opposition, however, as compared with the heterogeneous and shifting character of the government's support on the many matters coming up for decision, made it exceedingly difficult to carry on the business of the country. For some time close co-operation between the government and Robert Forke, the leader of the Progressives, facilitated the despatch of public business and secured for the government a narrow majority, but toward spring internal dissensions arose among the Progressives themselves, several of whom, especially among the Alberta members, became extremely critical of the government and of Mr. Forke's leadership of the Progressives. Meanwhile the government, perhaps with another election in view, was conciliating Progressive support and that of the ordinary voters by drastic cuts in the income tax and in the customs duties on automobiles, as well as by a reduction of letter postage from 3 cents to 2 cents.

The plans of the Liberal government were now, however, to be disturbed by an issue arising out of the maladministration of the Customs Department. Early in the session, specific charges of maladministration and graft had been made on the floor of the House by Hon. H. H. Stevens, a Conservative member from British Columbia and a former Minister of Trade and Commerce. These charges, in accordance with the usual practice, were referred to a committee of the House for investigation and report, the committee consisting of four Liberals, four Conservatives, and one Progressive. In spite of its composition, its report, presented on June 18, was unanimous. It declared that the evidence showed that for a long time 'the Department of Customs and Excise had been slowly degenerating, and that the process was greatly accelerated in the last few years.' In particular Hon. Jacques Bureau, when Minister of Customs, from 1921 to 1925, 'failed to appreciate and properly discharge the responsibilities of his office, and as a result there was a lack of efficient, continuous, and vigorous control of subordinates by the headquarters staff at Ottawa.'

Such an indictment, concurred in by representatives supporting the government, led several Progressives to vote against the government on various points connected with the investigation, thereby placing it in a minority. When an amendment moved by Mr. Woodsworth, a Labor member, proposing an extension of the investigation to all parts of the country, but forbearing to censure the government, had been accepted by the government but defeated in the House, Mr. King, realizing that he no longer had the support of a majority and feeling that Mr. Meighen was also unable to command the support of a majority, advised the Governor-General to dissolve Parliament and have another appeal to the electors. The governor-general, Lord Byng of Vimy, felt, however, that he could not lightly grant the dissolution of a newly-elected House of Commons, presumably representing the public opinion of the country. Thereupon Mr. King announced the resignation of his government on June 28, 1926. His position was that as the Governor-General had rejected his advice, and as the Governor-General could constitutionally act only upon the advice of his prime minister, it was now incumbent upon the Governor-General to find a new advisor who would accept the responsibility for the refusal of the dissolution.

On Mr. King's resignation, Mr. Meighen was on June 28 invited to form a government, and was sworn in the next day. With the acceptance of a salaried office under the crown he automatically vacated his seat in the Commons until he could be re-elected, and for the few remaining days of the session he had to act through Sir Henry Drayton, Minister of Finance in his previous government, who became leader of the House of Commons.

Some at least of the Progressives had given Mr. Meighen assurances of temporary co-operation for the sake of putting through unfinished business and voting the supplies without which the public service could not be carried on, but the difficulty was to do these complicated things in a constitutional manner when all parties were tired of a six months' session of Parliament. Under the constitution inherited by Canada from the United Kingdom, every one of Mr. Meighen's supporters who was appointed as a minister of the crown necessarily vacated his seat* and thus reduced the number of the government's much-needed supporters until such time as he should be re-elected—a process which would require at least two months. The obvious course would have been to accept the delay as a necessary evil, to adjourn Parliament for two or three months, appoint and re-elect the ministers, and call a short autumn sitting to finish the business and vote the supplies. However, anxious to hurry matters up, the premier adopted the rather novel expedient of appointing not ministers but unsalaried 'acting ministers' from members of Parliament who had already been sworn in as privy councillors and were thus eligible for ministerial positions. The fact that these 'acting ministers' were unsalaried, it was thought, avoided the necessity for the vacating of their seats.

The Liberals protested strongly against the unconstitutionality of the arrangement, and denied the right of the temporary ministry to issue orders in council—the recognized means of executive action. The disposition of the customs enquiry was almost lost sight of in the new issue of the alleged usurpation of power and the right of the 'acting ministers' to carry on public business and ask Parliament for supplies. This contention was expressed in a motion made by Mr. Robb, former minister of finance in the King Government, to the effect that the members of what was called the 'shadow cabinet' should resign their seats, if they held office legally, while if they did not hold office legally they had no right to control the business of government, and ask Parliament to vote supplies. The carrying of this motion by a vote of 96 to 95 on July 1 (one member of the majority stated afterwards that he had inadvertently voted when paired), made it impossible for the new government to continue to transact business with the existing Parliament. Mr. Meighen acted quickly; on July 2 Parliament was dissolved, and another general election became a necessity. Before this, however, on June 29, Parliament had carried by a vote of 119 to 109 an amendment of Mr. Stevens, to the effect that the failure of the Liberal administration, who were cognizant of the situation in the customs department, to remedy that situation was 'wholly indefensible.'

The new prime minister, relieved of the burden of parliamentary business, announced his cabinet on July 13, and proceeded to prepare for the election, which, in the opening speech of his campaign on July 22, he announced for September 14. In this period of nearly 2 months, both he and Mr. King toured the country from ocean to ocean. The Conservatives, having come so near winning in the previous year, considered that the customs revelations would constitute the finishing stroke, though they also stressed their time-honored policy of higher protection. The Liberals, and perhaps even more the Progressives and Labor members, emphasized the constitutional issues, while the Liberals took credit for the country's return to prosperity and the reductions of taxation by the Robb budget.

The result of the elections of Sept. 14 was in favor of the Liberals, who elected 118 members as compared with 91 Conservatives. There were also 11 Liberal-Progressives, 8 'unhyphenated' Progressives, 11 Progressives of the United Farmers of Alberta group, 3 Labor members, 2 Independents, and one seat still doubtful as between a Liberal and a Progressive on Sept. 24. The 11 Liberal-Progressives ran on a joint ticket, giving the Liberals 129 pledged supporters in a house of 245, but the straight Progressives, the Laborites and the Independents are also expected to give the Liberal Government a general support. The course of the Alberta group is on many questions rather uncertain, though they are certainly opposed to higher tariffs.

On Sept. 25 the Meighen government tendered its resignation and Mr. King took the oath of office. His Cabinet is as follows:

Prime Minister and Minister of External Affairs—W. L. Mackenzie King.

Minister of Finance—J. A. Robb.

Minister of Justice—Ernest Lapointe.

Minister of Railways—C. A. Dunning.

Minister of Interior—Charles Stewart.

Minister of Public Works—J. C. Elliott.

Minister of Agriculture—W. R. Motherwell.

Minister of Trade and Commerce—James Malcolm.

Minister of Customs and Excises—W. D. Euler.

Minister of Health—Dr. J. H. King.

Minister of Immigration—Robert Forke.

Postmaster General—P. J. Veniot.

Minister of Marine and Fisheries—P. J. Cardin.

Solicitor General—Lucien Cannon.

Secretary of State—Fernand Rinfret.

Minister of Labor—Peter Heenan.

Minister Without Portfolio—Senator R. Dandurand.

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* This is an old provision to prevent the crown granting salaried positions to members of parliament, and thus inducing them to do its will rather than that of the people. The lack of such a rule in the eighteenth century made it possible for George III. and Lord North to secure a majority for their American policy and thereby contributed to the American Revolution.

TEMPORARY PAGES FOR NELSON'S L. L. ENCYCLOPAEDIA

Insert in Volume **II**, following page **483** M

Review of the History of Canadian Development in the Last Sixty Years

National Wealth, 1867—$1,500,000,000
National Wealth, 1921—$22,200,000,000

The far-flung population of the Dominion of Canada celebrated on July 1, 1927, the sixtieth anniversary of the Confederation of their scattered provinces. The fiftieth, occurring in the middle of the Great War, had passed almost unnoticed, but amends were made by the splendor of the 1927 celebration and the enthusiasm of the people. Tested by the fires of war, her equal national status recognized by the League of Nations, the Mother Country and the other nations of the British Commonwealth, Canada finds herself in 1927, the great post-war depression over, on the threshold of what promises to be a period of wonderful development, surpassing all the achievements of her past. It is with what has been accomplished since Confederation that this article proposes to deal.

Growth of Area and Population.—The four original provinces of Ontario, Quebec, New Brunswick and Nova Scotia, had at Confederation a total area of 350,188 square miles and a land area of 338,224 square miles. But in the act which united these provinces (the British North America Act), there was provision for the inclusion of the other British colonies of the northern half of North America, and by the acquisition of the Hudson Bay Territory in 1870, the entry of British Columbia in 1871 and Prince Edward Island in 1873, the Dominion was increased ten-fold, to its present area of 3,684,723 square miles, of which 3,547,230 is land area. Canada thus ranks among the largest territorial units of the world.

Yet mere extent of area is of little value without population and development. The vast increase of the area of the Dominion added only about 200,000 (half of them in Prince Edward Island) to its original population as enumerated in 1871, raising the total from 3,485,761 to 3,689,761. From this original figure the population had increased to 8,788,483 at the census of 1921 and is estimated at 9,519,520 in 1927. While the increase in the Maritime Provinces on the Atlantic Coast has been comparatively small, the population of the great central provinces of Quebec and Ontario has doubled (Ontario, 1,620,851 in 1871, 3,187,000 in 1927; Quebec 1,191,516 in 1871, 2,604,000 in 1927). In Western Canada, however, the expansion has been phenomenal. Between 1871 and 1927 Manitoba has increased from 25,228 to 647,000 and British Columbia from 36,247 to 575,000. Again, Alberta and Saskatchewan, which had no existence in 1871, had respectively 617,000 and 836,000 people in 1927. These two provinces, created from the North West Territories in 1905, complete the line of Canadian provinces from ocean to ocean. Western Canada, which in 1871 was composed of the isolated Red River Settlement, ordinarily accessible only through the United States, and the even more isolated settlements on Vancouver Island and the near-by mainland of British Columbia, with perhaps 25,000 white people in all, has today about 2,700,000 of the most energetic and progressive people in the world, who rank among the world's largest producers and exporters of food-stuffs. Further, the Pacific Province of British Columbia is extraordinarily rich in minerals, fish and forest products.

The growth of total population, as in other countries of the white man's world, has naturally been accompanied by an even greater growth of urban population. At its first census in 1871, the new Dominion contained only one city of over 100,000—Montreal, with 115,000 people. In 1921 Montreal had 618,000 people and Toronto, which had only 59,000 in 1871, had 522,000. Far more remarkable is the growth of Winnipeg and Vancouver, the former having only 241 people in 1871 and 192,000 in 1926, the latter having no existence as late as 1885 and 117,217 people in 1921. Calgary and Edmonton, with only 4,000 people each as late as 1901, had each 65,000 people in 1926. Much slower, yet still rapid, has been the growth of Hamilton and Ottawa, with 26,000 and 24,000 respectively in 1871, and 114,000 and 107,000 in 1921. Quebec, which increased only from 59,699 in 1871 to 95,193 in 1921, has declined in relative rank from second to seventh place. The total urban population in 1921 was almost equal to the rural.

Agricultural Development.—On the whole, agriculture is still the chief occupation of the Canadian people, whose occupied and improved lands between 1871 and 1921 have increased from 36,000,000 to 141,000,000 acres and from 17,000,000 to 71,000,000 acres respectively. But while the older agriculture was for home consumption the more modern is for world consumption. While in the first decade after Confederation, Canada's production of wheat did not equal her home consumption, in the six crop years ended July 31, 1926, Canada's exports of wheat and wheat flour expressed as wheat were 1,496,000,000 bushels, as compared with 1,372,000,000 bushels exported from the United States; Canada is thus the world's largest exporter of wheat, the white man's staple food. Oats, hay, and clover rank next to wheat among Canada's leading field crops, the total value of which increased from $111,000,000 in 1871 to $1,121,000,000 in 1926. Stock-raising has also become an important branch of the farming industry, while the total value of dairy products has increased from $15,000,000 in 1874 to $238,000,000 in 1926. The aggregate total value of the products of Canadian farms in 1926 was $1,668,000,000, while the total capital invested in agriculture in the same year was $7,817,000,000. The total value of the Canadian agricultural products (including animals and their products) exported in 1926 was $797,000,000, as compared with only $48,500,000 of Canadian products of all descriptions exported in 1868, the first year of the Dominion.

Forestry.—At Confederation, Canada was a 'lumber-lot' even more than a granary, and the annual value of the lumber industry, as ascertained at the census of 1871, was $31,000,000—a figure which compares with $134,000,000 in 1925. But the intervening period has been marked by the greater elaboration of the product, and the pulp and paper industry of Canada, which produced commodities to the value of $1,000,000 in 1871, achieved a production valued at $193,000,000 in 1925. In 1926 the Canadian production of newsprint paper was 1,882,000 tons, making the Dominion definitely the leading producer of newsprint in the world.

Mining.—Until long after Confederation, Canada's contribution to the mineral production of the world was insignificant. Gold and coal are the only minerals with a recorded production in 1871, 105,000 oz. and 1,063,000 tons respectively. The first year for which complete statistics of mineral production exist is 1886, when the total value of the minerals produced was only $10,000,000—a figure which has risen to over $241,000,000 in 1926, when Canada produced the following percentages of the world production of the following minerals: nickel 90, asbestos 85, cobalt 55, gold 9, silver 8, copper 4. In coal Canada is estimated to possess one-sixth of the world's total reserves, mainly in Alberta. Rapidly as the production of the mines has expanded, new discoveries of paying ores are continually being reported, especially in the Canadian Shield formation which covers an enormous area in Eastern Canada. British Columbia is also immensely rich in metallic ores and coal.

Fisheries.—The fisheries of Canada are one of its most slowly growing industries, yet an annual production of $6,600,000 in 1870 has risen to $48,000,000 in 1925, largely owing to the addition of the fisheries of the Pacific to those of the Atlantic coast; British Columbia contributed $22,400,000 to the 1925 total, largely through her salmon and halibut fisheries, while cod and lobsters are the most valuable products of the East.

Water Powers.—Canada, with half of the fresh water in the world within or on her borders, possesses enormous resources in water power, owing to the waterfalls, which in earlier days greatly impeded navigation and prevented settlement. While watermills ground the grain of the pioneer settlers, it was not until about 1900 that any great use was made of 'white coal.' At that time the total developed water-power was only 170,000 H.P., in 1910 it was 975,000 H.P. and in 1926 4,556,000 H.P., this latter figure representing only 11 per cent. of the water power already known to exist. The use of comparatively cheap electricity is becoming more and more universal for both domestic and commercial purposes in the chief manufacturing areas of Canada.

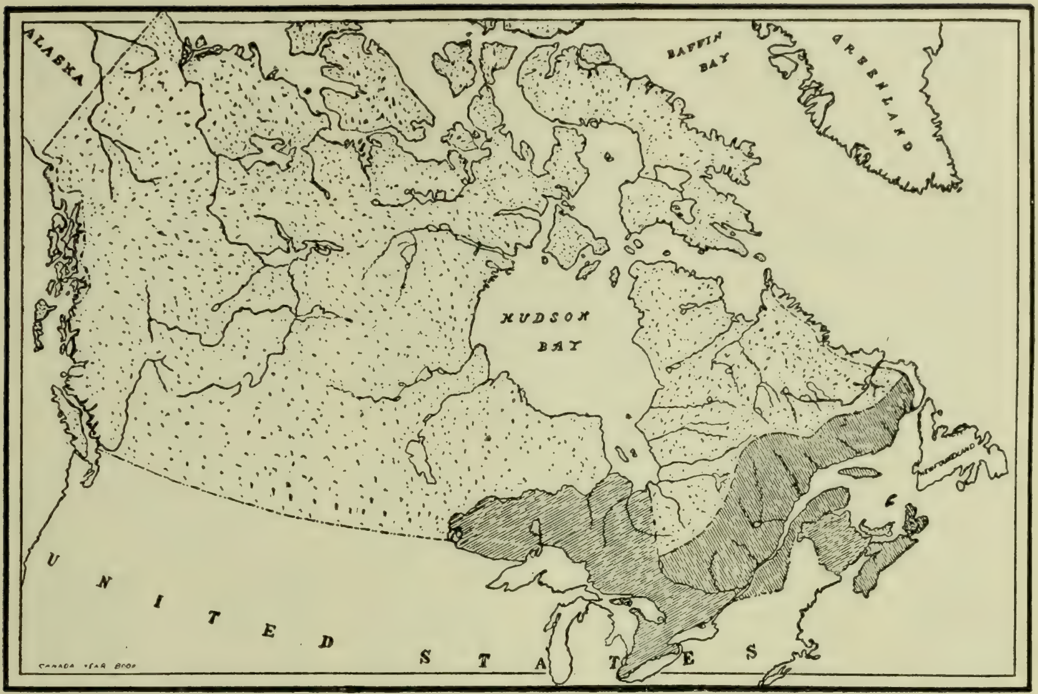
Manufactures.—Up to Confederation the manufactures of Canada were on a small scale, largely of the domestic type and designed for local use rather than for export. At the census of 1871 the statistics collected for all manufacturing industries showed 41,259 establishments with an invested capital of $78,000,000, 188,000 employees and a gross production of $221,000,000. By 1890 gross production had increased to $470, 000,000 and by 1905, under a new system which excluded from consideration all factories with fewer than 5 employees, to $706,000,000. In 1910 the gross production of manufactured goods was $1,166,000,000, and by 1920 manufactured products (exclusive of custom clothing, dyeing and laundry work, boot, jewelry, automobile and bicycle repairing, blacksmithing and custom work by foundries), reached a total value of $3,772,000,000. This was at peak prices, but the census of 1925, taken on the same basis, showed an invested capital of $3,808,000,000, 544,000 employees and a gross production of $2,948,000,000 in the manufacturing industries of Canada, while 1926 production will be well above the $3,000,000,000 mark.

To some extent the great development of Canadian manufacturing industries in the past generation has been due to the protective tariff, but certainly the existence of abundant raw material and cheap power and a competent, intelligent and well-disposed labor force have been larger factors in the result. In recent years there have been frequent amalgamations among the manufacturing industries, some of which are now on a very large scale. While most of the manufacturing industries still use Canadian raw material, some, like the rubber industry, the cotton industry, and the sugar industry, import their raw material, producing finished goods to the value of $78,000,000, $73,000,000 and $68,000,000 respectively in 1925. Canada is now reckoned by the League of Nations as one of the eight important industrial countries of the world, and has a permanent seat on the governing body of the International Labor Office.

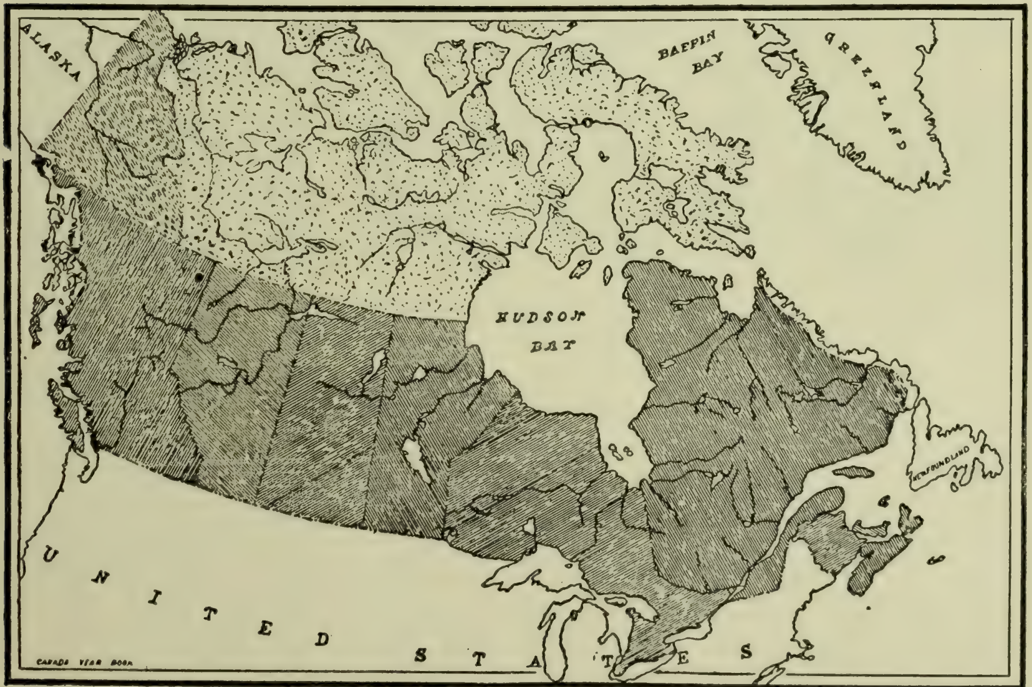
Construction.—Construction in Canada has long since passed the day of small things when the pioneer built his own shack and invited the neighbors to his 'barn-raising.' Besides the building up of great cities and of highways of transportation such as the great railways, the good roads, and the new Welland canal (q.v.), large sums are being spent upon the development of hydro-electric power for industrial purposes. Construction contracts awarded in Canada in 1926 were valued at $373,000,000.

Trade. — The aggregate external trade of the Dominion in 1868, the first year of Confederation, was $119,792,000 and in the sixtieth year (ended March, 1927) $2,298,000,000—an almost twenty-fold increase. Exports of Canadian produce increased from $48,500,000 in 1868 to $1,252,150,000 in 1927, or 26 times, while imports increased from $67,090,000 to $1,031,000,000 or only about 15 times. Up to the Great War there was usually an excess of imports, especially during the period of rapid development from 1900 to 1913. During the war and since there has usually been an excess of exports over imports, this excess amounting to $401,000,000 in 1926 and (allowance being made for re-exports) to $236,000,000 in 1927. When Canada's trade in the calendar year 1926 is compared with the trade of other nations, it is seen that the 'remote dependency' of 1867 ranks fifth among the nations of the world in trade in 1927—immediately after the four great industrial countries, the United States, the United Kingdom, Germany and France. Nor is Canadian trade merely in raw materials; the Dominion exports such manufactured goods as flour, newsprint, automobiles, agricultural implements throughout the world, justifying her claim to be 'the second manufacturing country in the British Empire.' Indeed, she now exports a larger value of manufactured commodities than she imports.

Transportation. — Nothing is more remarkable in the history of Canada than the development of her system of transportation and communication which has brought British North America together physically as Confederation united it politically. Most notable are the great railways which stretch across the Continent, with 40,352 miles of line in 1925 as compared with 2,278 miles in 1867, while their gross earnings have increased from $19,500,000 in 1875 to $455,000,000 in 1925. Electric railways, again, have increased their gross earnings from $5,750,000 in 1901 to almost $50,000,000 in 1925, or about nine-fold in 25



Canada in 1867



Canada in 1927

years. These increases have occurred in spite of the introduction of automobiles, which numbered 836,000 in 1926 as compared with 2,130 in 1907. Ocean-going shipping entered and cleared has increased from 13,000,000 tons in 1868 to 75,000,000 in 1926, and coastal shipping from 10,300,000 tons in 1876 to 82,900,000 tons in 1926. The aeroplane is used in transporting passengers to remote points and in surveying the northern wildernesses.

Not less remarkable is the development of means of communication. The postal revenue of the Dominion has risen from $525,000 in 1868 to $30,330,000 in 1926. While the use of the telegraphs has also greatly increased, telephones in use are 1,144,000 in 1925 as compared with 302,000 in 1911. Finally, private receiving radio stations numbered 135,000 in 1926, as compared with 33,000 in 1924.

Public Finance.—The national revenue of Canada in 1868, a time when the functions of government were about at their minimum, was about $13,700,000, and at this low figure covered the expenditure. The revenue receipts in the sixtieth year of the Dominion were $383,000,000—or about 28 times greater. Expenditures have also greatly increased, but except for the war expenses, have not been out of proportion to the receipts. The net debt of the Dominion, which was $75,000,000 at Confederation, rose to $336,000,000 in 1914, but the difference was mainly represented by public works. The war and its aftermath increased it to $2,453,000,000 in 1923, but in June 1927 it had been reduced to $2,306,000,000, with a more than proportionate reduction in the interest charge.

Banking and Insurance.—The banking system of Canada, developed along similar lines to that of Scotland, consists of a comparatively small number of separate institutions, each with a considerable number of branches. Such branches numbered altogether 123 in 1868 and 3,770 in 1926, besides 195 branches in other countries. Meanwhile the combined assets of the chartered banks of Canada have risen from $78,000,000 in 1867 to $2,864,000,000 in 1926. The amount of life insurance in force in companies licensed by the Dominion Government has increased from $36,000,000 in 1869 to $4,610,000,000 in 1926, and the amount of fire insurance in force in Dominion companies from $188,000,000 in 1867 to $8,045,000,000 in 1926.

Education.—The first census of the Dominion in 1871 showed 20 per cent. of the adult population as unable to read or write; by the census of 1921 the proportion, inclusive of Indians, had been reduced to 5.1 per cent. Among the population of 10 to 14 years of age the proportion unable to read and write was only 2 per cent. in spite of the sparsity of settlement in certain areas. Secondary education is good and in several provinces entirely free of charge, and six of the nine provinces maintain provincial universities with very low fees. In 1925 there were 23 universities and 85 colleges in Canada, with about 32,000 students in regular courses. The total public expenditure of the Canadian people on education in that year was $133,000,000 or about 3 per cent. of the aggregate national income. Research work of a high character is done in the universities of Toronto and McGill, a notable achievement being the discovery of insulin by Dr. Banting.

Spiritual and Moral Progress.—This type of progress is not easily measured, yet it is worthy of notice that in 1921 less than one-half of one per cent. of the population classified themselves as atheists, agnostics, pagans or 'no religion.' One thing which has strengthened the religious forces of Canada since Confederation is the union of the various Methodist and Presbyterian bodies into strong united churches, together with the subsequent amalgamation of Methodists, Congregationalists and Presbyterians in 1925 as the United Church of Canada, although a considerable number of the latter remain aloof as the Continuing Presbyterian Church. Generally speaking, the low figures of criminality may be said to indicate the generally law-abiding and orderly character of the population. Convictions for criminal offences in 1925 numbered 27,111 or 289 per 100,000 of the estimated population; only 18 of these convictions were on the charge of murder. As in the United States, immigrants of certain nationalities contribute to the criminal class out of all proportion to their numbers.

In all these years Canada has maintained the friendliest relations with her neighbor across the border. Notable evidences of this pleasant relationship were shown in 1926 by the appointment of a Canadian minister to the United States and a United States minister to Canada; and in 1927 by the opening, in August, of the International Peace Bridge between Canada and the United States, at Buffalo, N. Y. The dedication of the bridge on Aug. 7, 1927, was attended by H.R.H. the Prince of Wales, Premier Baldwin, U. S. Secretary of State Kellogg, Vice-President Dawes, and other distinguished people.

view of the extensive naval base which is being constructed at Rosyth.

CANADA.—In Canada the connection between the St. Lawrence and the Great Lakes of North America has been completed by canals between Lake Ontario and Montreal, and by the Welland Canal for avoiding the falls and rapids of Niagara. The size of these canals has been increased repeatedly since 1825. The Welland Canal is being deepened to 25 feet, and widened to a breadth varying from 150 to 200 feet at the bottom, at an estimated cost of $45,000,000. With the completion of the work now under way on the St. Lawrence canals, vessels of 1,500 tons will be able to go from Lake Erie to Montreal.

PARTICULARS OF IMPORTANT SHIP CANALS (1914).

Canal.	Date of Opening.	Length (miles).	Depth (feet).	Width (feet).		Height above sea-level (feet).	Locks (No.).	Tonnage of vessels passing through canal.	Excavation (cubic yards).	Cost.
				Top.	Bottom.					
Languedoc	1681	148	6½	60	...	600	119	.....	.....	$15,000,000
Caledonian	1823	60	17	120	50	102	28	.....	.....	4,600,000
North Holland	1825	50	18½	123	31	Sea-level		.....	.....	.....
Welland*	1833	26¾	14	...	...	..	26	.....	.....	26,000,000
Suez	1869	90	36	213–262	...	Sea-level		20,125,120	80,000,000	100,000,000
Amsterdam	1876	17⅖	32⅙	410	164	Sea-level		.....	.....	11,000,000
Kronstadt	1885	17½	28	...	200	Sea-level		.....	.....	10,000,000
Corinth	1893	4	26	...	72	Sea-level		.....	15,000,000	6,400,000
Manchester	1894	35½	28	300	120	70	5	5,339,884	54,000,000	85,000,000
North Sea and Baltic	1895	61⅛	45	400	150	Sea-level		¶9,925,000	252,000,000	95,000,000
Sault Ste. Marie	1896	3	18	...	160	Single lock		72,472,676	.....	4,000,000
Chicago	1900	40	22	160–300	110–200	Sea-level		.....	.....	33,000,000
Bruges or Du Midi	1902	6¼	26¼	...	72	Sea-level		.....	.....	.....
Panama	1915	50½	41†	300–1000	649‡	85	6	.....	223,000,000§	375,000,000§

*Depth to be increased to 25 feet, and width to 150 to 200 feet, so that vessels can navigate the waterway from the head of Lake Superior to Prescott, on the River St. Lawrence, within 100 miles of Montreal. Total cost of improvement about $45,000,000.
†Minimum depth. ‡Average width. §Estimated cost. ¶Tonnage in 1912, before enlargement.

The Sault Ste. Marie ('Soo') Canal unites Lakes Superior and Huron. It is only 2 miles long, but boasts a larger tonnage of traffic than the Suez Canal. (See SAULT SAINTE MARIE.) It has long been a Canadian ideal to shorten the distance from Lake Superior to the sea. The Trent system of canals, which will eventually connect Lake Ontario with Georgian Bay *viâ* Lake Simcoe, has been constructed with this object. At present (1914), this system has been completed from Lake Simcoe to Healey Falls (160 miles). In 1899 surveys were begun for the purpose of connecting Georgian Bay through the intervening rivers and lakes with the Ottawa River system, and thence to Montreal. In 1903 all tolls on Canadian canals were abolished. (See CANADA, *Canals.*)

UNITED STATES.—As early as 1750 a canal had been dug in Orange county, New York, by Lieutenant-Governor Colden, for the transportation of stones. The first real lock canal planned was that from the Schuylkill River, near Reading, Pa., to Middletown, on the Susquehanna, in 1762. Work was begun in 1791, and 4 miles opened in 1794. The project was finished in 1827, under the name of the Union Canal.

During the Revolutionary War all canal projects were stopped; but after its close, work was energetically taken up again. Washington was the father of the scheme of a great interstate system of canals; and he was the first to develop and stimulate general interest in plans for connecting the Great Lakes with the Atlantic Ocean. Washington's original plan, to extend the Chesapeake and Ohio Canal to Pittsburgh, and from here to Ashtabula at Lake Erie, was carefully worked out, but had to be postponed on account of the excessive cost. Otherwise Baltimore would possibly have grown to the size and importance of New York, whose greatness and pre-eminence is largely due to the Erie Canal and the Hudson River.

Erie Canal.—The beginning of the Erie Canal was made by the Western Inland Navigation Lock Company, formed in 1792. This company finished 6 miles of canal around the rapids at Little Falls, navigable for small barges going to Lake Ontario. In 1803 all canals built by it were bought by New York State, and a greater plan of connecting New York City with Lake Erie was suggested. Under Clinton, as governor, the canal was opened from Buffalo to Albany, in November, 1825, with a total length of 352 miles. With the opening of the Erie Canal the time of freightage was reduced from 20 days to 10 days, while the freight rate was reduced from $100 a ton to $3 a ton. The passenger tariff was also cared for by means of light barges drawn by shifts of trotting horse teams, and the whole trip thus made in 3½ days. With the completion of the lines of the New York Central Railroad along the Hudson River and the Canal to Buffalo, however, business on the Erie Canal decreased greatly—although navigation was made free and tolls abolished in 1882.

New York State Barge Canal.—In November, 1903, an expenditure of $101,000,000 to rebuild the Erie Canal was authorized by popular vote of the citizens of New York State. The new plans called for a depth of at least 12 feet, and a bottom width of at least 75 feet—dimensions which would accommodate barges of 1,000 tons capacity or more. The new canal leaves Lake Erie at Buffalo, follows the Niagara River on the shore line of Lake Ontario to the Oswego River, thence continues in a general easterly direction to its junction with the Hudson River at Waterford. It is to be completed in 1915. (See NEW YORK STATE BARGE CANAL.)

The *Chesapeake and Ohio Canal* was carried out for 186 miles, as far as Cumberland, by 1850, at an outlay of $11,375,000; but its completion to Pittsburgh on the Ohio, making a total distance of 341 miles, has not yet been effected. Pittsburgh is now urging the construction of a canal north to Ashtabula on Lake Erie, the depth to be 16 feet, and the outlay $33,000,000. In this way Pittsburgh would have direct connection with the Atlantic Ocean. The *Morris Canal* connects the Delaware at Phillipsburg with the Hudson at Jersey City, crossing a spur of the Alleghanies; it is 102 miles long, and accommodates vessels of 80 tons.

The *Illinois and Michigan Canal,* which connects Lake Michigan with the Mississippi River, was opened in 1848. Its total length is 96 miles, with a total rise of 145 feet from the junction point with the Illinois River, at La Salle, to Chicago at Lake Michigan. The rise is surmounted by 17 locks, each 110 by 18 feet. The capacity is for 150-ton barges. A smaller canal, an addition to the Illinois and Michigan, and called the *Illinois and Mississippi Canal,* was started in 1892, and opened in 1907. This canal is 7 feet deep, 80 feet wide at the surface, with 37 locks, each 170 feet long and 35 wide. Beginning at Hennepin on the Illinois River, it goes 50 miles to the Rock River, and then 27 miles down the river to Rock Island, at the Mississippi. The capacity is for 600-ton barges.

The *Chicago Drainage Canal,* uniting Chicago with the Illinois and Des Plaines Rivers, is 40 miles long, 110 to 202 feet wide at the bottom, and 22 feet deep. (See CHICAGO DRAINAGE CANAL.)

The new *Cape Cod Canal,* from Barnstable Bay to Buzzard's Bay, Mass., started in 1909, will be 12 miles long and 30 feet deep, with a minimum bottom depth of 100 feet. It will cut off 100 miles, and the most dangerous portion, of the passage between New York and Boston. (See CAPE COD CANAL.)

PANAMA CANAL.—The construction of a canal at the Isthmus of Panama, to connect the Atlantic with the Pacific Ocean, was begun by a French company in 1881. The plan originally was for a tide-level canal 28 feet deep; but funds failing, a lock canal of 15 feet in depth was substituted. Work ceased in 1888, but was resumed in 1894 by a new company, and continued with a small force of workmen until the property was sold to the United States Government, which has completed a lock canal on original lines—by far the most important undertaking of its kind in the world, and the greatest engineering feat of history. For a complete account, see the article PANAMA CANAL.

See WATER TRANSPORTATION.

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Canal Zone, a strip of land 47 miles long and 10 miles wide, extending 5 miles on either side of the Panama Canal, from the Atlantic to the Pacific Ocean. By an agreement with Panama (ratified February, 1904), the United States received, in return for a payment of $10,000,000 and an annual rental of $250,000, the perpetual right of occupation of this territory, together with full control for police, judicial, sanitary, and other purposes; not including the cities of Colon and Panama, in which, however, jurisdiction was granted in all matters relating to sanitation and quarantine.

There were in 1912 9,770 Americans in residence, including 2,882 women, the remainder of the population being composed of Spanish, Italian and West Indian laborers, East Indian coolies, and a few Chinese. Schools have been established in the larger villages, which in 1912 accommodated 1,721 children.

The most important result accomplished by the United States in the Canal Zone has been the sanitation of the country. Swamps have been drained, streets cleaned and paved, and adequate sewage and water systems provided; while all buildings erected by the Government are effectively screened from mosquitoes. Yellow fever, malaria, and pneumonia, which decimated the French workmen, have either been stamped out or greatly reduced; so that the health rate of the Isthmus compares favorably with that of the United States. This work was done chiefly under the direction of Colonel Gorgas, who had already done such valuable work in Cuba.

By the Panama Canal Act of 1912, the government of the Zone was vested in a governor, to be appointed by the President of the United States and ratified by the Senate, together with such other officials as should be found necessary. In January, 1914, an executive order of the President established the permanent government of the Canal Zone, effective April 1. The President's order provided for several departments or divisions, all under the direction of the Governor, who will report to the President through the Secretary of War, by which the Canal Zone is to be governed and the Panama Canal operated. The departments and divisions are: Department of Operation and Maintenance, Purchasing Department, Supply Department, Accounting Department, Health Department, and what amounts to a civil government department.

The Department of Maintenance and Operation is to be under the direction of an officer of the engineer corps of the U. S. army, who is to be acting governor in the absence or disability of the governor. The Health Department is to be under the direction of a chief health officer, who is to be an officer of the Medical Corps of the army.

Col. George W. Goethals, the builder of the Panama Canal, was appointed the first governor.

See PANAMA; PANAMA CANAL. Consult *Reports of the Isthmian Commission;* Frank's *Things as They Are in Panama* (1913).

Canandaigua, village, county seat of Ontario county, New York, at the north end of Canandaigua Lake, and on the Northern Central and New York Central Railroads; 28 miles southeast of Rochester. It is beautifully situated, and has many fine buildings and residences. It is the seat of Canandaigua Academy and Granger Place School for Girls. Its chief industries are canning, brewing, tanning, and the manufacture of agricultural implements, tinware, and cigars. Pop. (1900) 6,151; (1910) 7,217.

Canandaigua Lake stretches north and south from Ontario to Yates county, New York, and is 660 feet above sea level. It is a beautiful lake, 14 miles long and from 1 to 1½ miles broad, and surrounded by cultivated fields. Its waters are deep and abound in fish. Its outlet is Flint Creek, which flows into Clyde River.

Cañar, a central province of Ecuador. Area, 1,570 square miles. Pop. 64,000. Numerous Inca remains are found. Its capital is Azogues.

Cañar, town in above province; 25 miles north of Cuenca.

Canara, INDIA. See KANARA.

Canarium, an Oriental genus of Amyridaceæ. Many of them yield edible drupes, timber, elemi resin, and black dammar gum (from *C. strictum*). *C. commune* is a native of the Moluccas, but introduced into many parts of tropical Asia. It is a tree about 50 feet high; its fruit is a drupe, of which the kernel is eaten raw, roasted, or made into bread. The tree also yields a resin, which may be substituted for copaiba balsam, having like properties.

Cana'ry (*Serinus canarius*), a species of passerine bird of the family Fringillidæ, or Finches. It is found wild in the Canary Islands, Madeira, and the Azores, and has been extensively domesticated in Europe and America, where it is common as a cage bird, and is much esteemed for its musical powers. In its wild state the canary measures about 5 inches, and is olive or apple green above, and golden yellow below, with markings of brown on the head, rump, and flanks. It frequents the neighborhood of human habitation; builds its nest of moss, dry grass, feathers, hair, etc., in high, bushy shrubs or low trees; and produces from two to four broods in the course of a season.

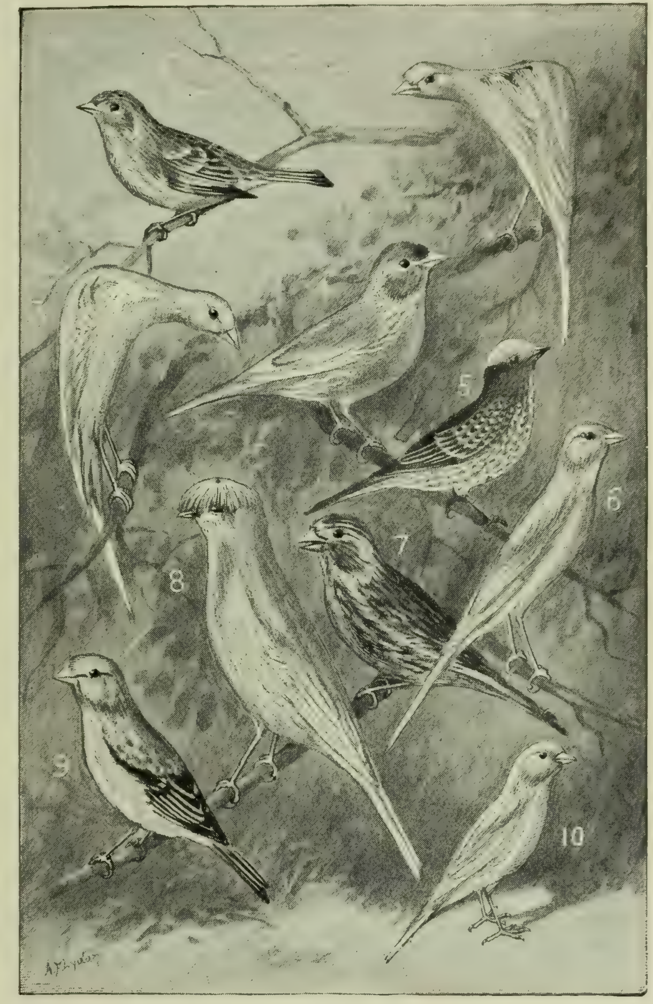
The canary breeds readily in confinement, often three or four times a year, laying from four to six eggs each time; seems thoroughly reconciled to cage life; and in many cases becomes very tame. By careful selection and breeding the size has been increased, the color modified, and the powers of song cultivated. The canary not infrequently lives fifteen or sixteen years.

Scientific breeding has produced a number of distinct varieties. The Belgian Canary is one of the most highly prized. It has a small, sleek head, long, curved neck, and broad, prominent shoulders, giving it its characteristic hunch-backed appearance. Not unlike the Belgian variety is the Scots Fancy, a very slender bird with a long neck and graceful body. The Yorkshire is a long, thin, very fine and closely feathered bird, with neat wings and tail. The Lancashire, formerly much fancied, but now little bred, is one of the largest of the canary tribe. The Norwich canary is bred chiefly for its beautiful plumage. The Manchester Coppy has a crest of feathers radiating from the centre of the crown. The Border or Cumberland Fancy is a small, neat bird, with very close and almost waxy appearance of feather, close-fitting wings, and whip-shaped tail. The London Fancy is a pretty little yellow or buff bird, with black wings and tail. Other varieties are the Cinnamon Canary, so called from its beautiful color; the Lizard Canary, whose comparatively dull body plumage is spangled with gold or silver; and the Roller Canary, a variety kept solely for its song, and trained with great care by means of a bird organ or by another highly trained bird called a 'schoolmaster.' The finest singers come from the Harz Mountains. Hybrids, known as 'mules,' are often produced by crossing with other finches.

The canaries seen in the United States are mainly importations of plain forms, preferably pure yellow, from Germany, whence many thousands are brought annually.

The care of the canary is very simple; cleanliness and a plentiful supply of proper food and water are the chief requisites. Canary seed and rape should constitute the principal food; while green leaves, such as chickweed, and lime, in the form of cuttle-fish bone, should be supplied.

See Cage Birds. Consult Wallace's *The Canary Book;* Robson's *Canaries, Hybrids, and British Birds in Cage and Aviary* (1912).

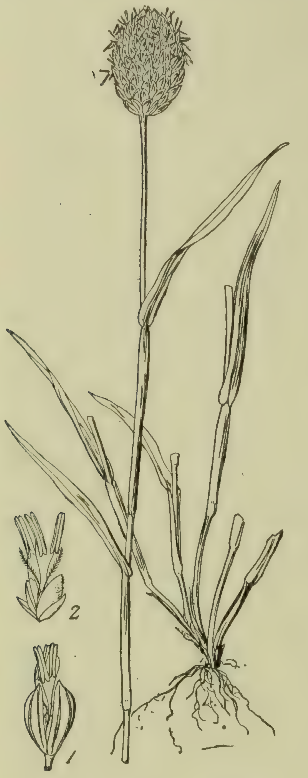


Canaries.

1. Wild Canary. 2. Belgian. 3. Scotch Fancy. 4. Norwich. 5. Lizard. 6. Yorkshire. 7. Cinnamon. 8. Lancashire Coppy. 9. London Fancy. 10. Border Fancy.

Canary Grass (*Phalaris canariensis*), a grass of which the seed is much used, under the name of *canary seed*, as food for cage birds, and which is on that account cultivated in the south of Europe, and in certain districts of Germany and England. It has become naturalized in many parts of Northern Europe, including Great Britain, but is a native of Southern Europe and the Canary Islands, where it sometimes furnishes a wholesome and palatable addition to or substitute for wheaten flour. It is largely grown for seed in Southern California. It reaches a height of 2 or 3 feet, with a spike-like panicle of one inch or more. The large Reed Canary Grass (*P. arundi-*

nacea), common on river banks, is an abundant source of coarse fodder; and Southern Canary Grass (*P. caroliniana*), or Apache Timothy, is also valued for forage. A striped variety is cultivated as 'Gardeners' Garters,' 'Ribbon Grass,' or 'Ladies' Traces.'



Canary Grass (*Phalaris canariensis*).

1, Flower; 2, Flower, with glume removed.

Canary Islands, a volcanic group of islands belonging to Spain, in the Atlantic Ocean, about 60 miles off the northwest coast of Africa, between lat. 27° 40′ and 29° 25′ N., and long. 13° 25′ and 18° 16′ W. The group includes seven large inhabited islands—Tenerife, Grand Canary (Gran Canaria), Palma, Lanzarote, Fuerteventura, Gomera, and Hierro (Ferro)—and a number of rocky islets, with a total area of 2,808 square miles.

The islands are bold and picturesque in outline, and mountainous in character, the chief elevations being volcanoes, of which the highest, the Peak of Tenerife (q. v.), rises 12,180 feet. There are no rivers, and on several of the islands water is very scarce. The springs on those better supplied are diverted by long artificial channels for the purpose of irrigation. The equable temperature and moderate rainfall make the islands an ideal health resort. The mean annual temperature is about 70° F.; the minimum 60° F., and the maximum 86° F. The rainy season lasts from November to March, practically no rain falling in the summer and autumn.

Below 1,300 feet the vegetation is African in character, including the date palm, coffee tree, sugar cane, banana, orange tree, and the native dragon tree. For the next 1,500 feet, vines and cereals flourish; above this, various species of laurel and pine, notably *Pinus canariensis*, arborescent heaths, and the retama, a sweet-scented broom, are found. There are over 900 species of wild flowering plants on the islands, about 400 of which are peculiar to the group.

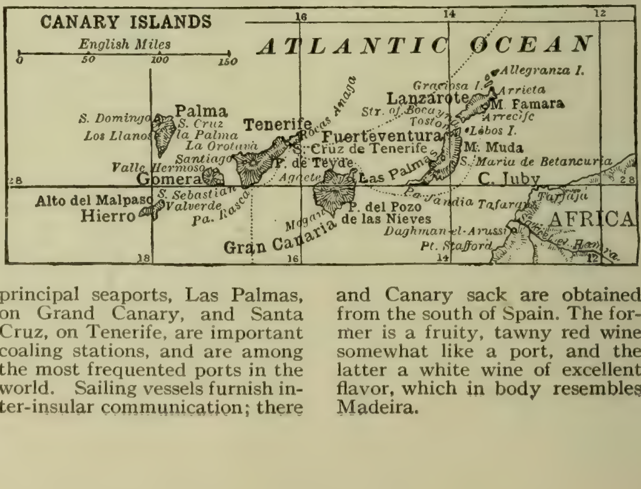
The soil responds well to cultivation, and agriculture is the chief industry. Wine, sugar cane, tobacco, wheat, and maize are produced, and large quantities of fruit and early vegetables are grown, especially bananas, potatoes and tomatoes. Cochineal was formerly an important product, and is still cultivated to some extent. Fisheries are of considerable importance, giving employment to some 10,000 persons. The only mineral product is pumice stone, which is found on the island of Tenerife. Fabrics of silk, cotton, and linen, hats, and baskets are manufactured. The women excel in lace making and embroidery; and there are small sugar, tobacco, and shoe factories.

Commerce is chiefly with Great Britain and Spain. The three main articles of export are bananas, tomatoes, and potatoes, shipments of which for 1913 were valued at $9,382,469. Imports consist mainly of coal, foodstuffs, and manufactured goods. The principal seaports, Las Palmas, on Grand Canary, and Santa Cruz, on Tenerife, are important coaling stations, and are among the most frequented ports in the world. Sailing vessels furnish inter-insular communication; there are electric tramways on Tenerife and Grand Canary; and a concession has been granted for a railway of about 50 miles from Santa Cruz to the interior of the island of Tenerife.

The Canary Islands form a Spanish province, with Santa Cruz as the capital. Tenerife, Palma, Gomera, and Hierro constitute one district under the provincial governor; Grand Canary, Lanzarote, and Fuerteventura form a second district under a sub-governor. The official religion is Roman Catholic. Pop. (1911) 419,809, mostly Spanish.

The Canary Islands are supposed to have been the *Fortunate Isles* or *Isles of the Blest* (q. v.) of the ancients. They were rediscovered in 1334 by a French vessel, and were first taken possession of (1402) by a Norman, Jean de Bethencourt. The title later passed to the king of Spain, and after a struggle with the native inhabitants, the Guanches (q. v.), extending over the greater part of the fifteenth century, the Spaniards in 1495 made themselves masters of the whole archipelago.

See separate articles on the principal islands. Consult Olivia M. Stone's *Tenerife and Its Six Satellites;* M d'Estes' *In the Canaries with a Camera* (1909); A. S. Brown's *Madeira and the Canary Islands* (10th ed., 1910); E. and F. du Cane's *The Canary Islands* (1911).



Canary Seed. See CANARY GRASS.

Canary Wine, or TENERIFE, a dry white wine, famous from the sixteenth to the middle of the nineteenth century. Since that period it has lost its high position on the market. It is, moreover, inferior to Madeira (q. v.), which has largely replaced it, in all the properties of character, body, fulness, and bouquet. It was produced chiefly in the northwest of the isles around Tenerife. At the present time a Canary port and Canary sack are obtained from the south of Spain. The former is a fruity, tawny red wine somewhat like a port, and the latter a white wine of excellent flavor, which in body resembles Madeira.

Canastota, kan-*a*s-tō′*ta*, village, New York, Madison county, on the Erie Canal, and the Lehigh Valley, the New York Central, and the West Shore Railroads; 21 miles east of Syracuse. Manufactures include furniture, wagons, farm implements, engines, cut glass, condensed milk, and canned goods. Pop. (1910) 3,247; (1920) 3,995.

Canaveral, Cape, ka-nav′*er*-*a*l, in Florida, near the middle of the Atlantic Coast. It has a lighthouse of the first order, 137 feet above high water.

Canber′ra, the capital of the Commonwealth of Australia, near the Cotter River; 150 miles southwest of Sydney. Situated on two commanding hills, it occupies an area of about 12 square miles in the Federal Territory, a tract of 900 square miles, ceded to the government by New South Wales in 1910. A strip of Federal Territory connects the capital with its port, on Jervis Bay, an almost completely landlocked harbor of sufficient size and depth to accommodate the entire British fleet.

The commission for city plans was awarded in 1912 to W. B. Griffin of Chicago, Ill., and in March 1913 the work of building was begun. Because of the war, however, operations were practically suspended for a term of four years. By deliberate design Canberra is to resemble in a general way the capital of the United States. From the Parliament building, as a centre, radiate wide streets to be occupied by other public buildings. The plans also provide for three large ornamental lakes, several public parks and recreation grounds, a market, and civic, educational, and residential sections. Canberra is the seat of the Duntroon Royal Military College, and at Captain's Point on Jervis Bay, is the Royal Australian Naval College.

About eight miles of railway have been completed within the Territory (1925). The Canberra-Queanbeyan line, five miles in length, connecting with the New South Wales system at Queanbeyan, was opened for goods traffic in 1914, and for passenger traffic in October 1923.

Parliament will meet in Canberra for the first time in 1927. With the removal of the Federal departments from Melbourne, the entire administration of the city and its public utilities will be under the Federal government. Pop. (1914) 1,714; (1924, estimated) 3,677.

Can′by, Edward Richard Sprigg (1819–73), American soldier, was born in Kentucky. He was graduated from West Point (1839), and served in the Seminole War (1839–42) and the Mexican War (1846–7); winning the brevet of major at Contreras and Churubusco, and that of lieutenant-colonel at the City of Mexico. He took part in the Utah expedition (1857–60), and in the expedition against the Navajo Indians (1860–1). During the Civil War he was placed in command of the Department of New Mexico (1861–2), and drove out the Confederates under General Sibley; commanded New York City and Harbor during the Draft Riots of 1863; was in command of the Department West of the Mississippi in 1864–5; assisted in the capture of Mobile; and received the surrender of Gen. Richard Taylor in 1865. At the close of the war he was brevetted major-general for his services, and entered the regular army as brigadier-general. He served as military governor of South Carolina (1868), and afterward commanded the Division of the Pacific. He was killed near Siskyou, Cal., by the Modoc Indians while in conference with their leader.

Canby, William Marriott (1831–1904), American botanist, was born in Philadelphia. He engaged in the banking business, but devoted much time to the study of botany and the collection of specimens of the flora of the United States and Canada. He also served as botanist to the Northern Pacific Transcontinental Survey. His large herbarium of 30,000 species is now owned by the New York College of Pharmacy, and a smaller one by the Delaware Society of Natural History. From 1881 until his death he was president of the Wilmington Savings Fund Society.

Cancale, käṅ′kal′, seaside resort, department Ille-et-Vilaine, Northwest France; 6 miles northeast of St. Malo. Noted for its oysters. Pop. 8,000.

Can′can, or Chahut, a dance somewhat of the nature of a quadrille (q. v.), but characterized by high kicking and other suggestive movements; invented by Rigolboche, a notorious *danseuse*, about 1830.

Cancao, Cambodia. See Ha-tien.

Can′cella′tion (Latin *cancellare*, 'to make like lattice work,' 'to strike out by means of cross lines'), in Mathematics, signifies the elimination of a common factor in both numerator and denominator of a fraction. A fraction being a proportion, any common factor occurring in the numerator or denominator may be therefore eliminated without altering its value. Thus—

$$\frac{4}{8} = \frac{\cancel{4} \times 1}{\cancel{4} \times 2} = \frac{1}{2}.$$

Algebraical expressions are simplified on similar principles.

Cancelling of Deeds. A legal document is said to be *cancelled* when its force is destroyed by some intentional act of the maker or other party having right thereto, or by the judgment of a court. A common form of cancellation is by striking out the signature, and also, if it be a deed under seal, by tearing off the seals. Courts of equity will cancel deeds which are marred by fraud, or which on other grounds would operate unjustly. A cancelled or destroyed deed does not revest the thing granted in the grantor, though it terminates all personal engagements established by the deed. Fraudulent cancelling, destroying, obliterating, or concealing of any deed forming the title or part of the title to land is a felony. See Alteration.

Cancellus. See Chancel.

Cancer, or Carcinoma, is one of the two varieties of Malignant Tumor, the other being known as *Sarcoma* (q. v.). The term Cancer does not indicate a single distinct disease, like pleurisy or appendicitis, but is applied to a group, the members of which are similar in many respects, and quite different in others—especially as regards the degree of malignancy and the form of treatment. For all practical purposes, both carcinoma and sarcoma may be here considered under the heading of Cancer, as they are equally malignant.

Carcinoma may occur in the skin, mucous membrane, mouth, and intestinal canal, and in the stomach, uterus, heart, liver, and other organs. The new growth commences by a proliferation of the existing cells of the epithelial tissues of the body. Very often these proliferating cells form solid columns, enclosed in a framework of connective tissue, and in this form invade the surrounding normal tissue. The cells are medium sized or larger, with large nuclei; they are variously shaped, depending on the variety and the situation of the growth; and they resemble the cells of the tissue from which the growth arises. In cancer of the skin and mucous membrane the structure is peculiar and characteristic, the cells being arranged in concentric layers, looking very much like the cross section of an onion; this is called a 'pearl' formation.

Growth.—Particular emphasis is to be placed on the fact, now thoroughly established, that at its inception cancer is a local disease, restricted to a small area. If the new growth is not removed or destroyed, however, the cancer cells rapidly multiply, and invade the surrounding normal tissues; and sooner or later enter the blood or lymph vessels, and are borne with the current to adjacent lymph glands, and to other parts of the body, often at some distance from the primary growth. Wherever the cancer cells lodge, multiplication follows, and a secondary or metastatic tumor is the result. These secondary tumors resemble the primary growth in structure, and they may become, in turn, the centres for further dissemination of the disease. A typical example is to be found in cancer of the breast, in which invasion of the lymphatic glands under the arm eventually follows the appearance of the growth in the breast; and instances of secondary tumors in the intestinal tract, lung, and liver are common.

In a brief time the new growth undergoes degenerative changes, which terminate in the destruction of the tissue composing the cancer. If the growth is on the surface, ulceration occurs, with progressive destruction, and the discharge of a foul-smelling fluid. The patient becomes feeble and anæmic, with impairment of the nutritive functions and other systemic disturbances—the so-called *cancerous cachexia.*

Unlike the benign tumors, which have a dense capsule of fibrous tissue, serving to confine the growth within definite limits and prevent invasion of the surrounding tissue, there is no capsule in malignant tumors, and consequently there is nothing to prevent the cells from invading the normal tissues in all directions. This explains why removal of a benign tumor is followed by complete recovery; whereas in the case of a malignant tumor it is often impossible to go far enough into the tissues to extirpate the entire area invaded by the cancer cells.

Distribution.—Cancer is well-nigh universal in geographic distribution, and no country or district of the globe is free from its ravages. Claims have been made that certain races possess immunity to cancer. For a long time, for example, it was supposed that Japan was immune to a remarkable degree, but since that country has made such rapid strides in medicine, statistics have been published which show that its death rate from cancer is actually higher than in some European countries (*e.g.*, Spain). These statistics also confute the theory that those who restrict themselves to a vegetarian diet are not liable to cancer, for the peasants of Japan live largely upon rice.

Nor is the disease restricted to the human family, for it has been found extensively among other members of the animal kingdom, as cattle, horses, dogs, cats, birds, fish, molluscs, and reptiles.

Cause.—The essential cause of cancer is unknown, though many theories have been advanced to explain tumor formation. These may all be grouped under two general classifications: (1) those which assume the presence of some living organism, or the theory of *parasitic origin;* (2) those which presume the cause is to be found within the body itself, or the theory of *biological origin.*

A strong impetus was given to the parasitic theory in the summer of 1925 by the work of Dr. W. E. Gye and J. E. Barnard in Great Britain. Dr. Peyton Rous, of the Rockefeller Institute had previously (1910) published an interesting study of a sarcoma-like tumor in the domestic fowl, tissue from which, crushed, suspended in suitable fluid, and filtered, was capable on injection of producing tumors of a nature identical with the growths from which the filtrate was obtained. Gye found that cultures of this same chicken tumor, treated by chloroform and injected into healthy chickens, did not produce tumors, but these cultures mixed with suitable cultures from human or animal carcinoma did produce a tumor of the Rous type. From this he concluded that the parasite is killed by chloroform but leaves in solution a certain tumor-forming substance. When a filtrate carrying the 'cancer parasite' is mixed with the killed culture, the two work together so as to produce, on injection, a tumor of the Rous type. Gye's colleague, Barnard, moreover, with a special photographic apparatus in which light of a very short wave length can be used to photograph details not visible under the ordinary microscope, was able to demonstrate spheroidal bodies in cultures of chicken tumors which these investigators believe to be parasites. This work has been generally considered as extremely interesting and suggestive, but many considerations still prevent its general acceptance as proving the presence of a parasite as the final causative agent of cancer.

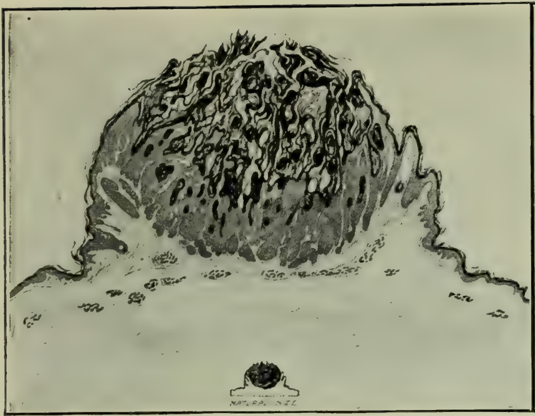
Contradictory views are also held regarding the influence of heredity. Many cases are on record where cancer has appeared in several successive generations; but while heredity plays a *rôle*, it is believed to be not an important *rôle.*

An important advance has been the recognition of certain precancerous conditions, benign in every respect, but which at any time, as the result of irritation, may undergo a malignant change. Among these conditions are moles, warts, wens, birth marks, old scars, burns, lupus, and chronic white patches upon the tongue (leukoplakia); the irritation caused by sharp fragments of teeth, ill-fitting dental plates, and bridges; X-ray burns; injuries and blows, particularly to the breast; and chronic irritation such as is found among workers in pitch, tar, paraffin, and aniline dyes. Constant local irritation of any character is dangerous, a common example being cancer of the lip following the irritation produced by a pipe ('smoker's cancer'). Cancer of the uterus often follows neglected tears occasioned during childbirth.

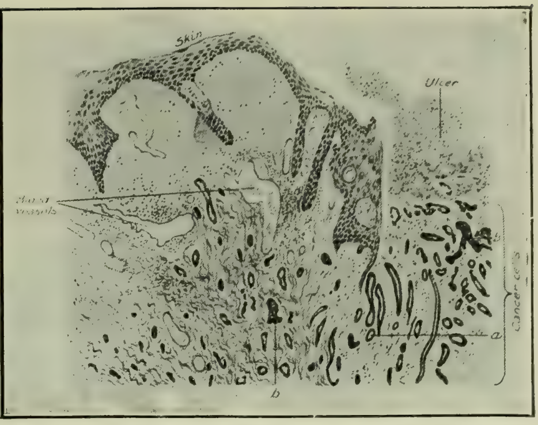
Symptoms.—Cancer is largely a disease of middle and advanced life, although it frequently appears in the young. Any lump, growth, chronic sore, or unusual discharge occurring after thirty-five years of age should be regarded with suspicion, and the advice of a competent surgeon sought at once. The absence of pain does not preclude the possibility of cancer, for pain is never a prominent symptom in the early stages. The rate of growth may be rapid or slow, depending on the variety: those varieties which contain a large amount of fibrous tissue do not generally grow as rapidly, nor are they as malignant, as those which contain a relatively large number of cells. The cancerous cachexia, described above, does not appear until late in the course of the disease.

Any of the following symptoms may be considered as danger signals: *Skin.*—Cancer here commences as a warty-like growth, which persists in spite of all simple medication, and which soon ulcerates and begins to spread. *Mouth and Lips.*—Any crack in the lip that does not heal readily is suspicious. In the mouth, any chronic sore or white patches should receive attention. *Stomach.*—Cancer of this organ is the most frequent, and the most difficult to recognize, for the symptoms are often very obscure. Pain after eating, nausea, eructation of gas and fluid, and later vomiting of blood and loss of weight are symptoms. *Intestinal Tract.*—The usual symptoms are colicky pain, obstinate constipation, and blood in the stools. *Breast.*—In 95 per cent. of cases the discovery of a lump is the first evidence. Pain may be absent, and is never important at first. *Urinary Organs.*—The presence of blood in the urine demands attention. *Uterus.*—Irregular or persistent bleeding, or a foul discharge, calls for immediate examination.

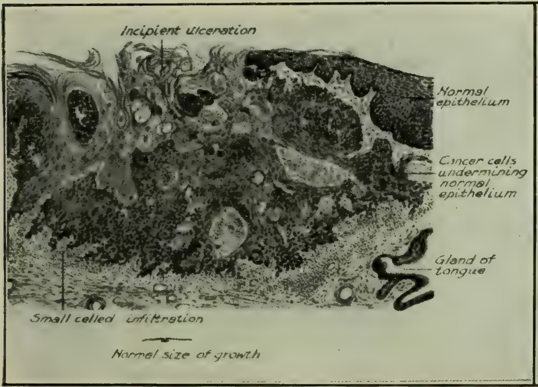
Prognosis.—According to statistics compiled by the U. S. Bureau of the Census for 1922 (published 1924), there were 80,938 deaths from cancer in the registration area of the United States (pop. 93,241,043), or 86.8 per 1,000 of population. While the total number of recorded deaths from cancer increases year by year, this does not necessarily prove that there is a relative increase in mortality. The statement has been made that all forms are on the increase, but this is not borne out by an



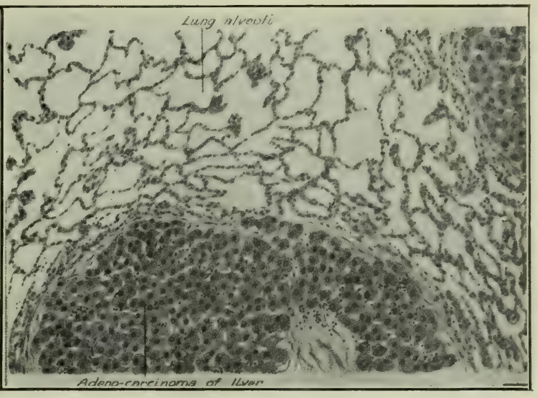
Epithelial wart from the back of the wrist of a worker in shale (paraffin distillation). Such warts give rise to the skin cancers common in workers in paraffin, pitch, some forms of tar, and to chimney-sweeps' cancer. (Greatly magnified.)



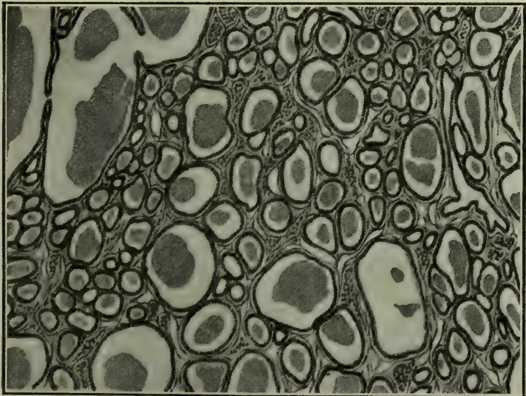
Ulcerating adeno-carcinoma of breast. The skin is being undermined and exfoliated by the tumor cells which in part (a) are reproducing perfectly the glandular structure of mamma, in part (b) growing as solid cords.



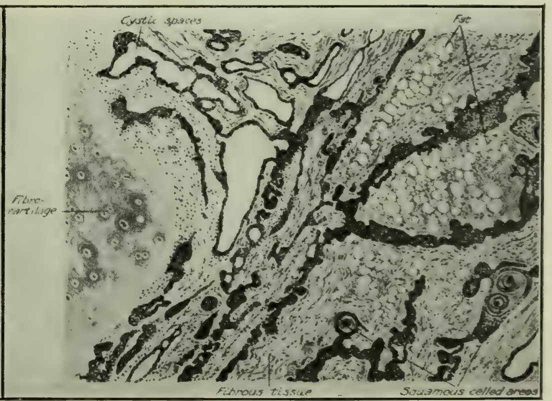
Early squamous-celled carcinoma (epithelioma) of the tongue, magnified 50 times to show all the features of a small but fully developed carcinoma.



Secondary deposit of adeno-carcinoma of liver growing in the lung. Note reproduction of structure of liver.



Malignant tumor of the thyroid gland, which, notwithstanding very close resemblance to the normal gland, and production of the typical secretion seen in the spaces, produces secondary growths especially in the bones. Such growths illustrate that what is known as 'benign' structure may be compatible with 'malignant' behavior.



Mixed tumor of the parotid region, containing fibro-cartilage and undifferentiated squamous-celled epithelium, cystic spaces lined by epithelium, fat and fibrous tissue.

(From William S. Bainbridge's 'The Cancer Problem,' Published by Macmillan & Co. By Permission of the Author.)

ILLUSTRATIONS OF TYPICAL CANCEROUS GROWTHS.

analysis of the records. There has been no apparent increase in cancer of the skin, uterus, ovary, and liver; there has been an apparent increase in cancer of the stomach, intestines, breast, and tongue; but this may be explained in part by improved methods of diagnosis and by the more careful recording of the causes of death. Whether the increase is real or only apparent has not yet been absolutely determined. Other statistics show that 1 in 8 women and 1 in 11 men over thirty-five years of age die of the disease.

This high death rate for cancer could be greatly reduced by an early recognition of the disease, followed by prompt and thorough surgical removal. If the operation is performed before the lymphatic glands are involved, the chances of a cure are decidedly good. The report of the results of operations for cancer at the Johns Hopkins Hospital shows 85 per cent. of cures before glandular involvement, and 42 per cent. after the glands had become affected. Statistics compiled by G. W. Crile show only 14 per cent. of cures after lymphatic invasion; and Winter of Prussia claims that 87 per cent. of his patients applied too late for permanent relief. Other investigators report that the victim of cancer does not seek advice until a year or a year and half after the onset of the disease. The excuses for delay are many—dread of an operation, and the tendency to wait until the symptoms are more urgent, being the most common. It should always be borne in mind that nothing is gained by delay, and that every day of waiting lessens the chances of a cure. A simple operation may be effective in the beginning, whereas a serious and dangerous operation later on may have only slight chances of success.

Treatment. — The remedial agents suggested or employed in the treatment of cancer include almost every drug and method known to man. Every now and then a new 'cancer cure' is announced, for there is no more lucrative field for the quack than the treatment of all varieties of tumors. Many of these so-called cures do positive harm to the patient; while others, harmless in themselves, cause a loss of valuable time. Cases of the spontaneous disappearance of a cancerous growth have been reported, and some of the alleged cures are based on this. Other 'cures' are due to an erroneous diagnosis of malignancy in the first place, and still others are reported before a proper length of time has elapsed, for a case cannot be said to be cured until at least five years after treatment, without recurrence.

As a matter of precaution, all sources of irritation should be removed immediately. If any of the symptoms indicated elsewhere in this article should appear, no time should be lost in seeking competent advice, and in commencing proper treatment. It is much wiser to remove all precancerous conditions at an early age, rather than to wait in the expectation that there will be no malignant change.

While there are methods of treatment that in some instances offer a degree of hope for the sufferer, the evidence from all sources points to the conclusion that surgery is the method of choice for all operable cancer. An operation, to be successful, should include the thorough removal not only of all diseased tissue, but of all neighboring lymphatic vessels and glands, even when they appear to be normal and healthy.

Among non-operative methods of treatment employed at the present time may be mentioned the x-ray, radium, and other radio-active substances, fulguration, electro-thermic coagulation, desiccation, diathermy, and a large number of extracts and sera. The lead treatment developed by Dr. Blair W. Bell of Liverpool probably represents the most important advance in the treatment of inoperable cancer since the introduction of x-ray and radium. All of these procedures have their advocates, and the best method or methods in a given case must be left to the judgment of the authority consulted.

Cancer Research.—The movement for scientific cancer research in the United States was inaugurated in 1898, when the New York legislature made a small appropriation for equipping and maintaining a laboratory. The money was placed at the disposal of the University of Buffalo, where a laboratory was established, under the directorship of Prof. Roswell Park. This was taken over by the State in 1901, and has since been known as the New York State Board of Health. In 1899 the Cancer Commission of Harvard University was organized, under the terms of a gift of Caroline B. Croft; in 1903 the Collis P. Huntington Fund for Cancer Research was instituted; and in 1912 the George Crocker Special Research Fund was established at Columbia University. The name has now been changed to the Institute of Cancer Research, founded by George Crocker.

Organized investigation into the nature of cancer, and what may be accomplished toward its cure or alleviation, has also been conducted by the Cancer Department of the Rockefeller Institute for Medical Research; the Research Department of the New York Skin and Cancer Hospital; the laboratory of the St. Louis Cancer Hospital; the Loomis Laboratory of Cornell Medical School; the Memorial Hospital of New York; the American Association for Cancer Research (1912); and the Research Hospital of the New York State Institute for the Study of Malignant Disease (1913), an outgrowth of the State Laboratory mentioned in the above paragraph.

Important institutions in Great Britain are the Cancer Research Laboratories of the Middlesex Hospital, the London Cancer Hospital, and the Imperial Cancer Research Fund, established in 1902 under the auspices of the Royal College of Surgeons. In Germany in 1900 a department of cancer was added to the Royal Institute of Experimental Therapeutics at Frankfort-on-Main. The work there was under the direction of the great scientist, Paul Ehrlich, and he made many important contributions to the experimental side of cancer, but after a few years, realizing the difficulty of the problem, he turned back to his original work on Chemotherapy and discovered salvarsan. In 1919 an Institute for Cancer Research was established in Berlin with Blumenthal as director. This replaces the old Institute for Cancer Research at the Charité Hospital in Berlin, of which von Leyden was director for many years. While not directly undertaking research, the German Committee for Cancer Research has not only stimulated investigations and obtained official recognition and facilities for such research, but has established an important journal for cancer research, the Zeitschrift für Krebsforschung, in 1904, which has appeared continuously since that time. In France there is an Association for the Study of Cancer at Paris, which publishes the important *Bulletin pour l'Etude du Cancer*. The International Association for Cancer Research was inaugurated at Heidelberg in 1906; since then it has held conferences at Paris (1910) and the last at Brussels (1913).

Bibliography.—Consult William S. Bainbridge's *The Cancer Problem* (1914); F. C. Wood's 'Review of the Advances in Our Knowledge and Treatment of Cancer in the Last Thirty Years' (*Medical Record*, July 3, 1915); Publications of the American Society for the Control of Cancer, notably *Essential Facts about Cancer* (1924); and *What Every One Should Know about Cancer* (1924).

Cancer Control, American Society for, a society incorporated in the State of New York, in

1922, whose main object is the collection and dissemination of information concerning the symptoms, diagnosis, treatment, and prevention of cancer, and the compilation of statistics in regard thereto. Its operations cover the United States, Hawaii, the Philippine Islands and Canada. It has an executive committee of 20 members whose work is directed by a managing director and small office staff. There is a chairman for each State and province. It works in close coöperation with the medical profession, State and local health boards, and the Red Cross, and each year endeavors to carry on an intensive campaign of a week to focus public attention on the subject of cancer.

Can′cer, a northern constellation, and the fourth sign of the zodiac, represented by the symbol ♋. In ancient Egyptian uranography Scarabæus replaced Cancer. It contains the star cluster known as the Præsepe (q.v.). ζ Cancri is visually triple, the close pair revolving about one another in 59 years, while the third component of the system moves round them in a period of undetermined length. Irregularities in its motion show that it revolves about a close, invisible companion in 17½ years. It is a spectroscopic binary, the period being 3.4 days.

Cancer Research. See CANCER.

Cancer Root (*Epiphegus virginiana*), or BEECHDROP, a parasitic herb of the order Orobanchaceæ, growing on the exposed roots of beech trees. It has a branching stem, purple and white blossoms, and scales instead of leaves. The whole plant is powerfully astringent, and was at one time reputed to be of value in cancer. The Indian Pipe (*Monotropa uniflora*) is also known as cancer root, and shares the same repute in popular medicine.

Cancer, Tropic of. See TROPICS.

Cancionero, kän-thē-ō-nā′rō (Spanish; Portuguese *cancioneiro*, 'song book'), in general, a collection of lyrical pieces by one or more authors; in particular, the designation of the official collections of the poetic guilds which flourished in the Middle Ages at the courts of Spain and Portugal. Among the more famous were the Cancionero of Alfonso de Baena, the Cancionero in the Limousin district, that of Lope de Stuñiga, that of Fernando del Castillo (1511); while no fewer than seven others are in the National Library, Paris. In 1511 Fernando del Castillo printed at Valencia a *Cancionero General*, or general collection of poetry, the first book to which this well known title was given. Similar collections were made of Portuguese poems as early as the thirteenth century. The term is also sometimes applied to a collection of poems by various authors on one subject, such as the *Vita Christi* (Saragossa, 1492).

Can′crum O′ris, known also as NOMA, WATER CANCER, and WATER CANKER, is a peculiar form of mortification or gangrene, arising apparently from defective nutrition. The disease usually occurs between the second and eleventh years, and is generally preceded by measles or some other disease. The following is the ordinary train of symptoms: more or less general disturbance of the system, accompanied by loss of appetite, followed by swelling of the salivary glands, and a profuse flow of fœtid saliva, which escapes from the mouth involuntarily during sleep; ulceration of the gums, which swell and become livid; looseness of the teeth; and the appearance of ash-colored spots on the gums and adjacent mucous membrane, which turn into dark-colored, sloughy sores. These sores spread rapidly by a gangrenous process, expose the bone, finally make a large aperture in the cheek, and may involve the tongue and palate as well.

Treatment.—Obvious measures are to remove the patient to pure air, to administer tonics, nourishing food, and (in moderation) stimulants; to touch the diseased parts with nitrate of silver, or glyceride of carbolic acid; and to wash the mouth frequently with peroxide of hydrogen or a weak solution of potassium permanganate. Surgical treatment may be employed. Death occurs in from 75 to 80 per cent. of cases.

Candaba, kän-dä′vä, town, Philippine Islands, in Pampanga province, Luzon, on the Pampanga River; 28 miles northwest of Manila. Fishing (in Candaba Lake) and weaving are carried on. Pop. (1918) 14,394.

Candace, kan′d*a*-sē, the hereditary title of the queens of Meroë, in Upper Nubia, has been specifically applied (**1.**) to the queen of Sheba who visited Solomon; (**2.**) to a queen of Meroë who twice invaded Egypt, and was twice defeated by the Roman general, Petronius; and (**3.**) to the queen of Ethiopia, whose high treasurer Philip converted to Chrisianity (Acts viii. 27).

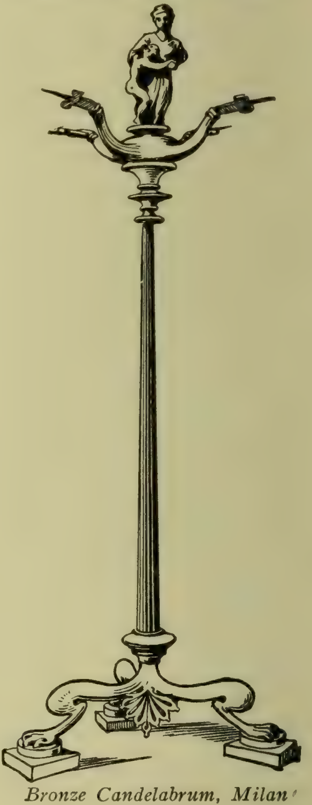
Candahar, kän-d*a*-här′. See KANDAHAR.

Candeish, kän-dāsh′. See KHANDESH.

Can′dela, commune, Italy, in the province of Apulia, 24 miles south of Foggia. It produces wine. Pop. 7,000.

Candelabrum, kan-de-lā′brum, an object which in ancient and modern times has often served the dual purpose of a candlestick and a lampstand. It was frequently designed according to elaborately ramiformed or 'branched' patterns; was wrought in many metals, precious and base, as well as in several kinds of stone; and varied in height from three to ten feet. Specimens found in Pompeii prove candelabra to have been common among the Romans, both for sacred and domestic uses. A beautiful bronze specimen of the twelfth century is in Milan Cathedral, and several fine examples are in the British Museum.

Candia, kan′di-*a*, the largest town in Crete, midway on its north coast. It has a small artificial harbor (much silted; steamers to Athens, Syria, Smyrna, Constantinople, and Trieste, irregularly), a large bazaar, and growing trade in island produce. The exports and imports each have an annual value exceeding $1,500,000. The Venetian walls, port, and arsenal remain, and traces of other fine buildings. The mediæval Cathedral of St. Titus was demolished about 1880; a new Greek one was consecrated in 1893. The population (1920, 24,848) is Greek, with a few Moslems, Jews, and others.



Bronze Candelabrum, Milan Cathedral

Candia was founded in 823 by Saracens; it stood a famous siege (1667–9), when the Turks captured it from the Venetians; and was further damaged by earthquake (1856), and by bombardment (1897).

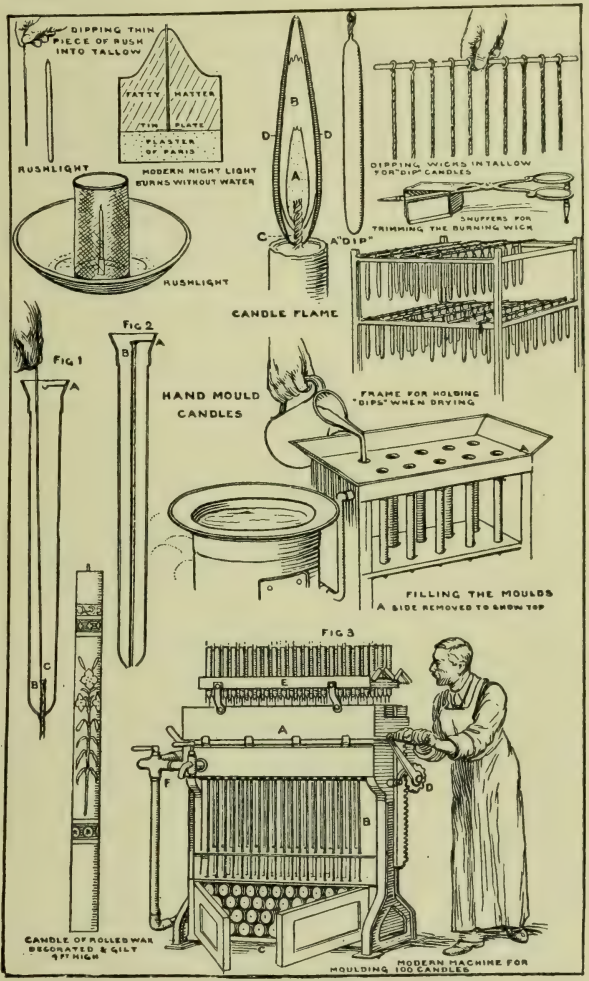
Candia is also used as an alternative name for Crete. See CRETE.

Can'didate (Latin *candidatus*, literally 'white robed,' Roman candidates being thus arrayed), any person who offers himself or is put forward for election or appointment to some post of honor. See ELECTIONS.

Can'dle, a rod of solidified tallow, paraffin, wax or other fatty material surrounding a wick. A chandler's apparatus has been found at Herculaneum, and a fragment of a candle, supposed to have been made in the first century, is in the British Museum; but candles are not mentioned in any writings before the end of the second century. Little advance in the art of candle making was brought about until the fifteenth century, when the process of moulding was introduced by de Brez. Wax and tallow were the only materials in use until toward the end of the eighteenth century, when spermaceti was introduced; and the manufacture of stearin began early in the nineteenth century. Candles are now made of tallow, stearin, paraffin, wax, spermaceti (qq.v.), and compositions. Paraffin wax for candle making is produced by several methods. (See PARAFFIN.) Stearic acid, or stearin, a substance largely employed in candle making, is obtained from tallow, or is a mixture of tallow and palm oil. See STEARIC ACID.

Wicks are usually made of fine cotton yarn. A wick must have good power of absorption, burn freely, and leave little or no ash; it must also be suited to the fatty matter employed. For moulded candles plaited or braided wicks are used; they are made flat, so that in burning they bend downwards into the flame and are totally consumed. Tallow dip wicks are bulky, and are loosely twisted.

Manufacture.—There are three modes of manufacturing candles—by pouring and rolling, for wax candles; by moulding, for most other varieties of candles; and by dipping, sometimes employed for tallow candles, hence called 'dips.' As wax cannot be moulded, on account of its tendency to stick to the mould, it must be poured over the wick. The wicks are fastened to a large horizontal wheel fixed over the projecting lip of a basin holding the melted wax, and the melted wax is poured over each in turn. When this has been done several times, the candles are reversed and the operation repeated, as the wax flows to the lower end and thickens it. The candles are afterwards rolled under pressure, and trimmed with knife and gauge.


DIPPING THIN PIECE OF RUSH INTO TALLOW
FATTY MATTER
TIN PLATE
PLASTER OF PARIS
RUSHLIGHT
MODERN NIGHT LIGHT BURNS WITHOUT WATER
RUSHLIGHT
B
D
D
A
C
A "DIP"
CANDLE FLAME
DIPPING WICKS IN TALLOW FOR "DIP" CANDLES
SNUFFERS FOR TRIMMING THE BURNING WICK
FRAME FOR HOLDING "DIPS" WHEN DRYING
FIG 1
A
C
B
FIG 2
B
A
HAND MOULD CANDLES
FILLING THE MOULDS
A SIDE REMOVED TO SHOW TOP
A
FIG 3
E
A
F
D
B
C
CANDLE OF ROLLED WAX DECORATED & GILT 4 FT HIGH
MODERN MACHINE FOR MOULDING 100 CANDLES

Candle Manufacture

Explanation of lettered diagrams:—*Candle Flame*—A, dark nucleus; B, luminous mantle; C, outer mantle, blue at base; D, faint outer veil of light. *Hand-moulded Candles*—Fig. 1, hand pulling up wick B by a thin rod C with hook at end; Fig. 2, wick held in position by hook A. *Moulding by Machinery*—A, box containing candle moulds; B, wicks; C, bobbins on which the wicks are wound; D, crank working pistons which push up the candles, leaving the moulds empty for next batch; E, 'nipper,' which grasps the candles when raised out of the moulds.

Spermaceti, paraffin, and stearin candles are moulded. The simplest form of mould is the hand-frame, in which hand-made candles are moulded. A number of mould-pipes (up to two or three dozen), held together by a frame, open into a trough at the top. The wicks are stretched through these, and secured at top and bottom by pegs or wires. The frame is heated to a little short of the solidifying point of the fatty material, which is then poured into the trough. When the candles in the moulds have solidified, the superfluous material is removed with a trowel. The machines now employed for candle-moulding will mould as many as 100 candles at one time. The moulds for the tips are made movable, so that when one set of candles has been moulded they are ejected from the tubes by an upward push of the tips, and are caught in clamps suspended above the trough. When the clamps are in turn raised, the wicks extend down through the tubes to bobbins arranged underneath. When the next set of candles is moulded, the wicks of those suspended in the clamps are cut, and the candles are taken out; and so the operations go on continuously. The moulds are warmed and cooled by a device admitting hot or cold water.

In dipping, the wicks are suspended from a frame and are repeatedly dipped into the melted tallow until the requisite thickness has been attained, the tallow being allowed to cool after each immersion. The ornamental patterns sometimes given to candles require special hand-moulds. Aniline or vegetable dyes are generally used for coloring, as mineral dyes interfere with the combustion. Polishing, to give an extra degree of gloss, is usually accomplished by rolling between cloth-covered rollers. Consult Lamborn's *Modern Soaps, Candles and Glycerine;* Brannt's *Manufacture of Soap and Candles;* Wright's *Animal and Vegetable Oils, Fats, Butters and Waxes, their Preparation and Properties* (1921).

Candleberry. See BAYBERRY.

Candlefish or OOLACHAN (*Thaleichthys*), a small fish allied to the smelt, which is found in vast numbers in the river mouths off the northern Pacific coast of North America. It is about 12 inches long, greenish olive in color, with an oily flesh, fine in flavor, and often used for food. It owes its popular name to the fact that the flesh is so oily that it will burn like a candle; and the fish is dried and used by the Indians as a torch, as well as for food.

Candlemas, the 2d of February, the day on which the Roman Catholic Church annually commemorates the Purification of the Virgin Mary and the Presentation of Christ in the Temple (Luke ii:22*ff*). On the same day the candles for the use of the church services during the coming year are also consecrated. The festival is also observed by the Anglican Church and Lutheran churches. In the Armenian Church the sacred new fire is kindled on Candlemas Eve; not at Easter, as is the usage elsewhere.

Candlenut, or CANDLEBERRY TREES (*Aleurites triloba* and *A. moluccana*), evergreen trees belonging to the order Euphorbiaceæ, which grow wild in the Pacific islands and other tropical places. They are characterized by large, thick, maple-like alternate leaves and clusters of small white flowers. The nuts are rich in oil, which is extracted for food and light, and is a drying oil used by painters, known as 'country walnut' or 'kekune-oil.' The nuts themselves when slightly baked and shelled, are strung on rushes, and enclosed in a screw-pine leaf, are sometimes used as torches for fishing. The kernel of the nut is edible when roasted, and a dye is obtained from the fruit; the hard shell also supplies lamp-black for tattooing.

Candle-power. See ELECTRIC LAMPS; GAS, ILLUMINATING AND FUEL.

Candle-tree (*Parmentiera cerifera*), a small shrub or tree, native to Panama. It bears large white flowers at the nodes, followed by yellowish white edible fruit not unlike wax candles in appearance.

Candlish, ROBERT SMITH (1806–73), Scottish preacher and theologian, was born in Edinburgh. He became minister of St. George's, Edinburgh in 1833 and after the death of Dr. Chalmers (1847) became the leader of the Free Church. In 1862 he succeeded Dr. Cunningham as principal of the New College, Edinburgh, the divinity hall of his denomination. His works include *Contributions towards the Exposition of the Book of Genesis* (1843–62); *The Atonement: its Reality, Completeness, and Extent* (1st ed. 1845; 2nd ed., rewritten and enlarged, 1861); *Examination of Mr. Maurice's Theological Essays* (1854); *The Fatherhood of God* (first series of the Cunningham Lectures, 1864–65); *Sonship and Brotherhood of Believers* (1872); *The First Epistle of St. John Expounded* (1866); *Reason and Revelation* (1859).

Candon, kän-don', pueblo, Luzon, Philippine Islands, in the province of Ilocos Sur., on the coast road; 24 miles south of Vigan. It carries on an important coast trade, produces indigo, rice, and tobacco, and has manufactures of cotton and silk. Pop. (1918) 19,950.

Candy. See CONFECTIONERY.

Candytuft, a genus of hardy plants of the family Cruciferæ. The annual species, *Iberis amara*, whose flowers are white, and *I. umbellata*, with flowers of different colors, by regulating the time of sowing can be had in flower at any time during spring, summer, or autumn. The perennial species are mostly beautiful white-flowering plants from three to nine inches high, usually evergreen and shrubby, and all hardy. The common evergreen candytuft, *I. sempervirens*, with several varieties, which bloom in April and May, is one of the best. *I. gibraltarica* is pink and white, with large flowers, but is not so hardy as the other kinds.

Cane, a name applied to certain small palms, as well as to varieties of the larger grasses, such as the bamboo and the sugar-cane, which have a slender, reed-like stem. Strictly speaking, the name should be applied only to the family of palms (*Calamus*) known as rattans. Owing to their lightness and strength, rattans are employed by the people of the East for the making of baskets, chairs, ropes, and similar objects, and great quantities are exported for similar purposes. The cane walking-stick is the malacca (*Calamus scipionum*), a native of Sumatra, the stem of which is thicker than the rattan. The 'cane' or 'cane-brake' of the Southern United States is *Arundinaria macrosperma*, reaching a height of about 25 feet. It has broad and flat leaves, and furnishes a valuable supplement to winter pastures. The flattened stems were used in aboriginal basketry and for mattings, and are now utilized for fishing rods and the like. The smaller cane (*A. tecta*), is also a fodder plant, and in its stalk, furnishes a coarse, strong fibre suitable for cordage.

Canea, kä-nā'ä, town, Crete, residence of a high commissioner, is situated on the north coast; 60 miles west of Candia. The town has a pleasant European quarter. The small artificial harbor (mediæval) is much silted but is protected by a long mole. The fortifications and citadel, as well as many other monuments, date from the Venetian period (thirteenth century). It has foundries, soap factories, and printing establishments. Pop. (1920) 24,946.

Canella, ka-nel'*a*, a genus of evergreen tropical trees, of which one, *C. alba*, called 'wild cinnamon,' is a native of the West Indies. It usually grows to a height of about twelve feet, and bears small violet flowers which yield a musklike fragrance. The fruit is a small black berry and the whole plant has a pleasant scent. 'Canella bark,' is stripped from the young branches, and has tonic properties.

Canephori, ka-nef'ō-rī, (Gr. *κανηφόρος*, 'basket-bearer'), high-born virgins and other Athenian women selected to carry baskets containing the implements of sacrifice in the Panathenaic and other processions. Canephori occur on the friezes of the Parthenon in the British Museum. In architecture canephori are female figures bearing baskets on the head; such figures support light entablatures in the manner of caryatides, with which they are sometimes confounded.

Canes Venatici, kā'nēz vē-nat'i-sī, the Hunting Dogs, a small constellation close behind the Great Bear, discovered by Hevelius. Its chief star, designated by Halley Cor Caroli, is of the third magnitude, and with a fifth-magnitude companion constitutes a pair delicately tinted in yellow and lilac. The 'Whirlpool' nebula, typical of the spiral class, was discovered in Canes Venatici by Lord Rosse in 1845.

Cane Sugar. See SUGAR.

Cañete, kä-nyā'tā, town, Peru, in the province of Cañete, on Cañete River; 90 miles south of Lima and connected by rail with Cerro Azul. The chief industries are the growing and manufacture of sugar, hat manufacture, and fruit growing. Pop. 3,500.

Canete, MANUEL (1822–91), Spanish man of letters, was born in Seville. Strongly conservative in politics, his courtly poems are now largely forgotten, though some of his lighter verse (*Poesías*, Madrid, 1859) has undoubted merit. His best poems are *La paz de Cuba* and *El arbol seco*, but he is best remembered as a fine literary critic, and editor and biographer of his famous friend, the Duke of Rivas. He also wrote dramas—*e.g. El duque de Alba, La esperanza de la Patria*, and *El rebato en Granada*.

Canfield, JAMES HULME (1847–1909), American educator and librarian, was born in Delaware, O. He was graduated (1868) from Williams College and was admitted to the bar in Michigan. He was professor at the University of Kansas (1877–91), chancellor of the University of Nebraska, 1891–5, and president of Ohio State University, 1895–9. In 1899 he accepted the librarianship of Columbia University. He was secrětary of the National Educational Association, 1887–9, and its president, 1890, and held office in lesser educational organizations. Besides numerous contributions to the periodical press, he published *Taxation, a Plain Talk for Plain People* (1883), *A Short History of Kansas* (1885), *Local Government in Kansas* (1887), and *The College Student and his Problems* (1901).

Cang (*cangue, kae*), a Chinese instrument of punishment for trifling offences, being a kind of wooden cage fitting closely round the neck, with the weight proportioned to the nature of the offence, but so constructed that the culprit cannot lie down or feed himself. It is not removed during the period of punishment, which may extend to two or three weeks. On the cang are inscribed the offence and the name of the criminal, who is generally left exposed at one of the town gates.

Cangas de Tineo, käng'gäs dā tē-nä'ō, town, Spain, in the province of Oviedo; 37 miles south of Oviedo. It has woollen and linen industries. Pop. (1920) 23,668.

Canicatti, kä-nē-kät'tē, town, Sicily, in the province of Girgenti, 15 miles north of Girgenti. It produces wheat, grain and wine and has sulphur mines. Pop. 25,000.

Canicular Days. See DOG DAYS.

Canidæ, kan'i-dē, the name of the dog family. The Canidæ are much less highly specialized forms than the cats, as is shown by their more numerous and less strictly carnivorous teeth, their blunt, nonretractile claws, and certain minor anatomical peculiarities. They have forty-two teeth in all—three small incisors on each side of upper and lower jaw, one large canine, four premolars, and two molars on each side in the upper jaw and three in the lower. Most of the dogs hunt in packs, combining to overthrow animals which would be too powerful for the efforts of individuals. The members of the family are widely distributed, the type genus Canis being truly cosmopolitan, though it is probable that the wild dogs of Australia were introduced by man. To the genus Canis belong dogs, wolves, jackals, and foxes, animals which differ from one another only in minor peculiarities. The wild dogs of Asia are placed in a separate genus, Cyon; while the genera Otocyon (Cape fox), Lycaon (Cape hunting dog), and Icticyon (American bush dog) differ from the type in some respects. See DOG, FOX; WOLF.

Types of the Canidæ, or Dog Family
1. Fox. 2. Black-backed jackal. 3. Dingo. 4. Wolf.

Canigou, THE, kä-nē-gōō', a snow-capped mountain (9,137 feet) at the eastern end of the Pyrenees, in the French department of Pyrenées-Orientales. Here, 5,600 feet above the sea, are famous manganese mines, which have been worked since the 13th century.

Canina, kä-nē'nä, LUIGI (1795–1856), Italian architect and antiquary, was born in Casale, Piedmont. He was professor of architecture at Turin, where he produced his standard work upon ancient architecture — *L'Architettura Antica descrittave dimostrata coi Monumenti* (12 vols. 1832–44). He likewise carried on important excavations at Tusculum and on the Appian Way. His other books include *Indicazione Topografica di Roma Antica* (1831; 4th ed. 1850–1), and *Descrizione dell' Antico Tusculo* (1841).

Canisius College, ka-nish'i-us, a Roman Catholic institution of learning in Buffalo, N. Y., opened in 1870 and incorporated in 1883, under the control of the Fathers of the Society of Jesus and registered by the Regents of the University of the State of New York. The college offers four-year courses in Liberal Arts, Natural Science, and Business Administration, besides the two year pre-professional courses preparatory to the study of Law, Medicine, and Dentistry. In addition to the recognition accorded Canisius College by the Regents of the University of the State of New York, the college is also a member of the Catholic Educational Association. The library contains about 25,000 volumes. For recent statistics see Table under the heading COLLEGE.

Canis Major, the Dog of Orion, one of Ptolemy's southern constellations. Sirius is its leading star. The next to it in brightness, β Canis Majoris precedes it in rising by twenty-two minutes. R Canis Majoris is a variable star, undergoing partial eclipses once in twenty-seven hours.

Canis Minor, an ancient constellation representing the Dog of Icarus, is situated northward of Canis Major. Procyon is its chief star.

Canister Shot. See AMMUNITION; CASE SHOT.

Canitz, kä'nits, FRIEDRICH RUDOLF LUDWIG VON (1654–99), German poet, was born in Berlin. He was the opponent of the mannerisms and extravagance of the second Silesian school, and the champion of simplicity, elegance, and sound sense, taking Horace and Boileau as his models. The first collected edition of his poems, *Nebenstunden unterschiedener Gedichte*, appeared anonymoulsy in 1700; a complete edition, with name and biography, in 1719. He wrote mainly occasional verse, odes, and satires, his work being at times characterized by genuine feeling, although somewhat stilted and bombastic.

Canker, a disease of fruit trees characterized by the splitting and death of part of the bark. Among the commoner causes of this condition may be mentioned careless pruning, planting in undrained soil, and excessive autumnal growth; but much the most important form of canker is that caused by the growth of various fungi, which, effecting an entrance through some small wound of the bark, spread rapidly, destroying the bark in its course. Around the wound thus formed the bark grows abnormally, and presents an areola of thick, warty excrescence.

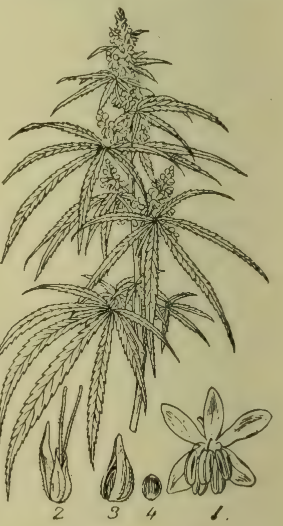
Among the more important of these fungi are *Nectria ditissima*, which causes European apple tree canker, *Nummularia discreta* which causes Illinois apple canker, *Sphaeropsis malorum*, the cause of New York apple tree canker and *Gloesporium malicorticis*, causing the Oregon apple canker. Canker often begins at the point of junction of two branches. In early autumn the fruits of the fungus may be seen, in the form of white specks, in crevices of the overgrown bark surrounding the wounds. In the spring another form of fruit, consisting of tiny reddish balls, appear in the same situation. Much grafted and budded trees are liable to canker. Young branches that are attacked should be cut off. When thick branches are affected, all the wounded parts should be cut away, and the cut surfaces luted with clay or protected with a coat of gas-tar. Grafts should not be taken from diseased trees, as parts that appear to be sound may contain the fungus in their tissues. The white stage of the fungus can be killed by applying with a brush a solution of sulphate of iron, one pound to a gallon of water.

Cankerworm, two destructive caterpillars of geometrid moths—the spring cankerworm (*Paleacrita vernata*) and the autumn cankerworm (*Alsophila pometaria*)—found in the United States from Maine to Texas. The spring species is about an inch long, naked, dark green and has a pair of prolegs on the hind end, and a single pair a short distance in front, and three pairs of true legs near the forward end of the body. The autumn cankerworm is very similar but has an additional pair of prolegs near the hind end. The eggs are laid on fruit and shade trees, and the larvæ frequently destroy the foliage of whole orchards in a few days. Spraying the trees with arsenicals, if thoroughly done, will kill the worms.

Canmore. See MALCOLM III.

Canna, kan'a, or INDIAN SHOT, ornamental plants belonging to the order *Cannaceæ*. They have ornamental leaves and large irregular flowers, red, orange, or yellow, in blazing tints and are popular in gardens and parks. They are natives of tropical and subtropical countries, and are therefore not hardy. Propagation is by division of the roots or by seeds. The latter are so hard that it is desirable to file through their outer coats and soak them in water for twenty-four hours previous to sowing. The seeds are best sown in heat in spring, and as the plants are injured by frost they should not be planted outside until the weather is settled. Division of the roots should be performed in March. In autumn the outdoor plants must be lifted and placed in a greenhouse or cellar, preferably being covered with a little dry soil. The old tall-growing plants with inconspicuous flowers are now almost replaced by the large-flowered dwarfish plants known as Crozy's hybrids. *C. indica* is the Indian Shot, with red-spotted flowers; *C. iridiflora* of Peru, with brown and crimson flowers, has been combined with *C. flaccida*, native to our Southern states, to form many hybrids known as Italian canna. *C. edulis* is cultivated in the tropics for the starch in its roots.

Cannabis, kan'*a*-bis, a genus of plants belonging to the order Urticaceæ, contains a single species, *C. sativa*, the common hemp. This is an annual plant of from three to ten feet in height, covered with fine hairs. The leaves are digitate, composed of from five to seven narrow leaflets. It is believed to be a native of India and Persia, but is now widely grown as a fibre plant. Herodotus referred to the cannabis as a Scythian plant. It has long been known as an intoxicant, and has also long been used in medicine. It is the essential ingredient in the Indian intoxicant known as bhang. *Cannabis indica* consists of the dried flowering tops of the female plants, and



Common Hemp

1, Male flower; 2, female; 3, fruit; 4, seed.

from these an extract and tincture are prepared for use in chronic spasmodic affections, as asthma, whooping cough, and migraine. See HEMP.

Cannæ, kan'ē, ancient town, Italy, in the province of Bari; 9 miles southwest of Barletta. In 216 B.C. it was the scene of Hannibal's disastrous defeat of the Romans under Lucius Paulus and Gaius Varro (see HANNIBAL).

Cannel Coal. See COAL.

Can'nelton, city, Indiana, county seat of Perry county, on the Ohio River, and on the Southern Railway; 133 miles southwest of Indianapolis. There are large coal mines and sandstone quarries in the vicinity, and the city has saw, roller, and cotton mills, potteries, brickyards, furniture and broom factories. Pop. (1910) 2,130; (1920) 2,008.

Cannes, kän, seaside resort, France, in the department of Alpes-Maritimes, on the French Riviera, 20 miles southwest of Nice. Opposite it, and separated from it by the Rade de Cannes, lie the Iles de Lérins (q.v.). Hills, rising to Le Cannet, two miles distant, cut off the northern winds and render the climate one of the most equable in Europe. These natural advantages have won for Cannes the title 'Pearl of the Riviera' and have made it one of the most popular of the Mediterranean resorts. The Promenade de la Croisette and the Casino Municipale are of special interest.

Cannes was founded by the Romans on a promontory between their *Via Aurelia* and the sea. During the Middle Ages it was held as a fief by the convent of the Lérins, and Abbot Adelbert began to build the Vigié or watch-tower in 1070. It was repeatedly attacked by the Barbary pirates, was twice entered by Charles V., and during the wars of religion was sacked by the Duke of Savoy. Its popularity as a resort dates from 1831, when Lord Brougham settled here. Its industries are concerned with the production of perfume, soap, glassware, fruit, and olive oil. Fishing is also of importance. Pop. (1921) 30,907.

Can'nibalism, the practice of eating human flesh is still observed among primitive peoples and in the past held its place even among tribes of a comparatively high level of culture. It has been inspired by a variety of motives, ranging from simple economic necessity to filial respect.

A modified form of cannibalism, based upon vastly higher instincts than the savage promptings of famine, has been developed by the belief that one may acquire the dominant qualities of a man or an animal by eating a portion of the dead body, notably the heart, an important stipulation being that it be eaten raw, with all its virtue unimpaired. A classical instance is that of the Issedones mentioned by Herodotus (iv. 26).

The eating of one's kinsfolk—*endophagy* or *endocannibalism*—was practised as a pious funeral rite by the ancient Egyptians and Libyans, as appears from the discoveries of Flinders Petrie. In such cases the act of cannibalism was not preceded by murder, but was, on the contrary, intended as a reverent method of disposing of the corpse of one's relative who had died a natural death. Similarly, aged relatives and newborn children are eaten by some of the primitive tribes of Australia—a custom intelligible enough on the principle that 'the life is not allowed to go out of the family.'

Cannibalism may be traced in the early history of many peoples. In the British Isles, Strabo points out that certain tribes in Ireland were reported to be cannibals; while St. Jerome asserts that the Attacotti of Argyllshire and Dumbartonshire delighted in the taste of human flesh. The frequent recurrence of human bones among the animal remains in the kitchen middens of Skerrabrae, in Orkney, has also been held to testify to the cannibal proclivities of the dwellers there. Although ceremonial cannibalism was common in Mexico, the practice was never prevalent in North America; in South America it was general among various native tribes, notably the Caribs, Tupi, and Mesayas.

Of living races who practise cannibalism the natives of New Guinea and some Central African tribes (Mangbatu, A-Zandeh, Fans) are the most conspicuous. The Maoris of New Zealand and the Fiji Islanders have, however, now quite relinquished this practice, once so widespread among them—the last recorded case amongst the former having occurred in 1843.

Consult R. S. Steinmetz' *Endocannibalismus;* Loeb's *The Blood Sacrifice Complex* in Memoirs of American Anthropological Association (1923).

Can'niff, WILLIAM (1830–1910), Canadian physician and author, was born near Belleville, Ont. He was graduated from Victoria College, Coburg, and studied medicine in Toronto, New York, and London. He served during the Crimean War in the English Royal Artillery and on his return to Canada became professor of general pathology, and subsequently professor of surgery, at Victoria College. During the American Civil War he attended the hospitals in Washington, and served for a short time in the Army of the Potomac. In 1867 Dr. Canniff took a leading part in founding the Canadian Medical Association. He was a delegate to the International Medical Congress at Paris (1867), was a staff-editor of the *Canadian Medical Journal,* and published *Principles of Surgery* (1866), *The Settlement of Upper Canada* (1869), *Canadian Nationality* (1875), and *The Medical Profession in Upper Canada* (1894).

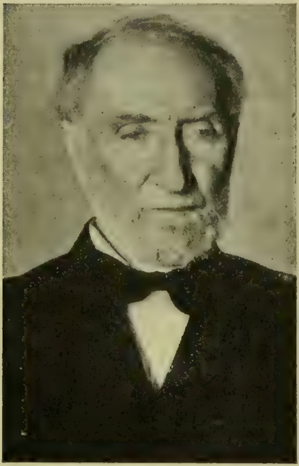
Canning. See FOODS, PRESERVED.

Canning, CHARLES JOHN, EARL (1812–62), British statesman, the third son of George Canning (q.v.), was born in Gloucester Lodge, near Brompton. He was educated at Eton and Oxford and in 1841 was appointed under-secretary of foreign affairs under Sir Robert Peel. Having demonstrated his great administrative abilities as Postmaster-general in Lord Aberdeen's cabinet (1853), he was chosen in 1856, by Palmerston, to succeed Lord Dalhousie as governor-general of India. Although he was severely criticized at the time of the Indian mutiny, it was later generally conceded that he had shown courage, wisdom, and firmness in this crisis. He became first Viceroy of India in 1858, and the following year was created earl.

Canning, GEORGE (1770–1827), British statesman, was born in London. He was educated at Eton and at Oxford, studied law, and in 1794 entered Parliament for Newport, soon proving himself a brilliant debater. His gift of wit and satire also found an outlet at this time in the pages of the *Anti-Jacobin* (1797–8), established to ridicule the excesses of the so-called 'revolutionaries.'

In 1796 Canning became under-secretary for foreign affairs; he was a member of the Indian commission in 1799–1800, paymaster general in 1800–01, and treasurer of the navy in 1804–06. He refused office in the 'Ministry of All the Talents' (1806) but became foreign secretary in the Tory administration which succeeded it (1807). Throwing himself with energy into the war against Napoleon, he planned the capture of the Danish fleet (1807), which established England's maritime supremacy, and vigorously supported the Spaniards in the Peninsula (1808). The failure of the expedition to Walcheren (1809) led to a duel between Canning and Castlereagh, the secretary of war; and as Canning refused thereafter to work with Castlereagh, he did not again hold prominent office until 1822. In the meantime he was member of Parliament for Liverpool (1812–22), was ambassador-extraordinary at Lisbon (1814), and president of the Indian Board, with a seat in the cabinet (1816–21), where he supported the coercive domestic policy of the government.

Succeeding Castlereagh as foreign secretary in 1822, Canning made it his policy to hold the balance between continental liberalism and the absolutism of the 'Holy Alliance.' Hence he asserted the principle of non-interference in the internal affairs of foreign states, and recognized the independence of Spain's American colonies (1823). He protected Portugal from Spanish intervention (1826), and so far allowed the claims of Greek independence as to propose the alliance of England, France, and Russia, which resulted (after his death) in the battle of Navarino. The retirement of Lord Liverpool in 1827 placed Canning at the head of the government, but he did not retain the support of Wellington, Peel, and the more unbending Tories. His premiership lasted only four months, a severe chill aggravated by mental anxiety causing his death on August 8, 1827. He was buried in Westminster Abbey.



Joseph G. Cannon

Canning's Reciprocity Act of 1823, and his measure to modify the corn laws—defeated by Wellington in the Lords (1827)—carried out the free-trade policy of Pitt, and anticipated that of Peel; while his efforts to secure Catholic emancipation in the bills passed by him through the House of Commons (1812 and 1825) made possible the Emancipation Act of 1829. His speeches are open to the charge of over-elaboration and excessive polish, but their cogency and wit constitute them otherwise models of parliamentary eloquence.

Consult Stapleton's *Political Life of Canning*, and *Canning and his Times;* Marriott's *George Canning and his Times;* Temperley's *Life of Canning.*

Cannizzaro, kän-nēt-tsä'rō, STANISLAO (1826–1910), Italian chemist, was born in Palermo. He studied medicine and chemistry in Palermo and in Pisa and became professor of chemistry at Alessandria in 1851, at the University of Genoa in 1855, in Palermo in 1861, and in Rome in 1871. He cleared up Avogadro's hypothesis as to the difference between atomic and molecular weights, thus affording strong confirmation of the atomic theory of the structure of matter and contributing to the development of modern chemistry.

Cannock, kan'uk, town, England, in Staffordshire, 7½ miles northwest of Walsall. Industries include tile making, the manufacture of edge tools, and coal mining. Pop. (1921) 32,321. CANNOCK CHASE, lying between Lichfield and Stafford, was originally a wooded district devoted to hunting, but is now a heath, with coal measures, and with iron-stone beds beneath the coal.

Cannon, SEE ARTILLERY; GUNS.

Cannon, ANNIE JUMP (1863–), American astronomer, was born in Dover, Del. She was graduated from Wellesley College in 1884, was an assistant at the Harvard College Observatory (1897–1911), and in 1911 became curator of astronomical photographs. She made regular visual observations of variable stars of long period with a six-inch equatorial telescope, and discovered 200 variable stars, four new stars, one spectroscopic binary and numerous stars having bright lines or variable spectra. Her publications include a bibliography of variable stars comprising about 75,000 references, a catalogue of 225,000 stellar spectra, which fills nine quarto volumes, *Harvard College Observatory Annals*, and short papers and notes on stellar spectra. She is a member of the American Astronomical Association, a Fellow of the American Association for the Advancement of Science, an honorary member of the Royal Astronomical Society (British), and a member of the American Philosophical Society.

Cannon, JOSEPH GURNEY (1836–1926), American political leader, was born in Guildford, N. C., of Quaker parents. His father, a country doctor, was drowned when Joseph was fourteen, and the boy was forced to leave school and work in a country store. He later became apprentice in a law office, and in 1858 began practice in Douglas county, Ill. From 1861 to 1868 he was State's attorney in Vermilion county and soon became a prominent leader of the Republican party in Illinois. He was representative in Congress from 1873 to 1891, from 1893 to 1912, and again from 1914 until his voluntary retirement in 1923, a period covering half a century with the exception of four years. He was chairman of the Committee on Appropriations from 1895 to 1903, and was noted for his opposition to all extraordinary expenditures. He was elected Speaker of the 58th, 59th, and 60th Congresses, and of the 61st Congress, also, but only after opposition, which resulted in a modification of the rules of the House. Immediately after adjournment of this Congress (1909), opposition developed to his further re-election as Speaker based mainly on his methods, deemed to be arbitrary, and his Payne tariff record, and in 1910 he was succeeded by Champ Clark, Democrat.

Cannon was often attacked as a reactionary, as a 'hide-bound protectionist,' and an impeder of progress, but his personal honesty and integrity were never questioned, and his personal popularity was great. He was familiarly known as 'Uncle Joe.'

Cannon-ball Tree (*Couroupita guianensis*), a South American tree belonging to the order Myrtaceæ. It bears round fruit with a hard, woody rind, used as a drinking-cup by the natives.

Cannon Bone, the single bone formed in many artiodactyle ungulates by the fusion of the third and fourth metacarpals or third and fourth metatarsals, the fusion producing a single strong bone with a complicated method of articulation to the two digits below. This bone gives length and rigidity to the limb, and is a mark of specialization in the animals in which it occurs. In pigs, as the least specialized of artiodactyle ungulates, there are no cannon bones, the metacarpals and metatarsals being free from one another. Cannon bones are best developed in the ruminants —*e.g.*, cow and sheep.

Cannon Pinion, in watchmaking, the small cogged wheel to which the minute hand of a watch is attached. See HOROLOGY.

Cannstatt, kän'shtät, or KANNSTATT, town, Germany, in Würtemberg, stands on the Neckar, 2½ miles east of Stuttgart, with which it was incorporated in 1905. It is famous for its hot saline springs and baths (water 62.5° – 66° F.) and is a flourishing industrial place, manufacturing machinery, zinc wares, electrical apparatus, Daimler motors, cloth, and bricks. It has, also, iron works and railway repair shops. Good fruit and wine are grown. The waters were known to the Romans, who established baths here in the eighth century. Pop. 27,000.

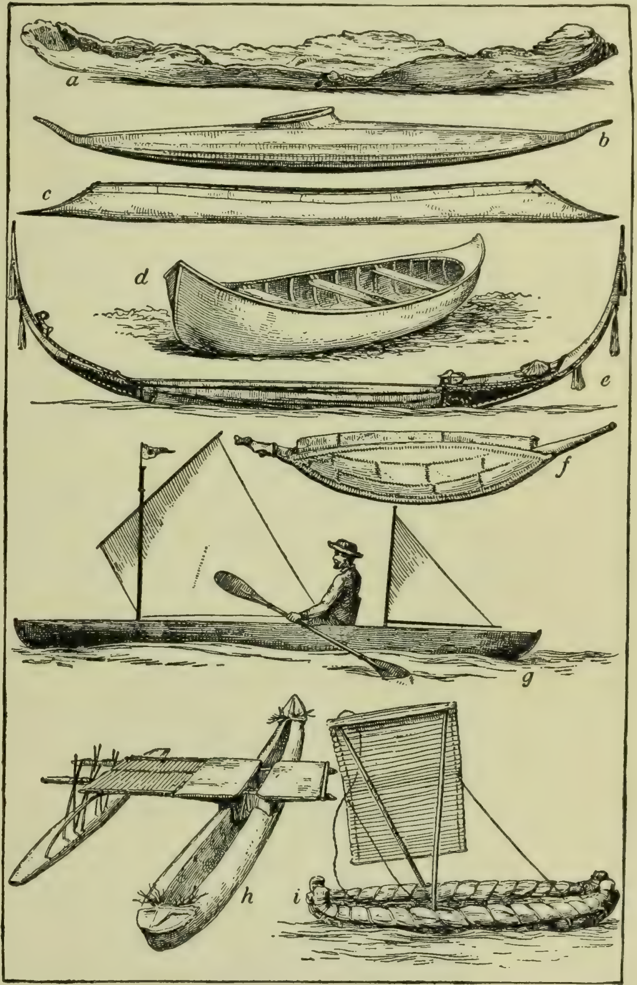
Can'nula, a small tube used in surgery, through which any abnormal collection of fluid is drawn from the body.

Cano, kä'nō, Alonzo (1601–67), Spanish painter, sculptor, and architect, was born in Granada. Having gone to Seville, he studied painting under Pacheco and sculpture under Juan Martinez Montanes, and painted in that city, Madrid, and Granada, where he founded a school. Philip IV. nominated him 'painter to the king' and royal architect. His work is characterized by boldness of design, facility of handling, a knowledge of chiaroscuro, and purity of flesh tints. Most of his paintings are in Seville, others in the Prado Museum at Madrid, a Madonna in the cathedral at Malaga, and the *Apostle Paul* in the Dresden Gallery. His best statue is the *Madonna and Child* in the Church of Nebrissa. *The Vision of St. John the Evangelist* is in the Wallace Collection, London. His chief architectural work is the cathedral at Granada.

Cano, Juan Sebastian del (*c.* 1460–1526), Spanish navigator, took part in Magellan's voyage around Cape Horn (1519), and on the death of his leader in the Philippines (1521) assumed command of the expedition. In the sole surviving ship of the fleet he returned, by the Cape of Good Hope, to Spain (1522), and was thus the first circumnavigator of the globe. Cano was lost while on a second expedition to the West Indies.

Canoe, a light boat without any fixed fulcrum to assist the user of the paddle by which the canoe is usually propelled. The canoeist, accordingly, always sits with his face toward the bow. Canoes are constructed of many different materials and in a great variety of shapes. In their simplest form they are lengths of tree trunks rudely shaped and hollowed out. 'Dug-outs' of this description were used by many primitive peoples, and the form is still to be seen in the *kistis* floating on out-of-the-way Indian waters. As used in Greenland waters, the canoe is flat-bottomed and flat-sided, but the ordinary Eskimo canoe has a curved whalebone framework, over which seal or walrus hide is stretched. Some native canoes have decks, others are fitted with outriggers; some are barely large enough for a single occupant, while others, especially the 'war canoes' of the Pacific Islanders, carry from forty to fifty persons.

'Rob Roy' canoes, so-named by their originator, John MacGregor (q.v.), who travelled many miles in them, are from 12 to 15 feet long, with a beam of from 26 to 30 inches and a depth of from 10 to 16 inches. The paddle is usually double-bladed, 7 feet long, with 6 inches of breadth in the blade. A mast with a light sail can be hoisted if desired. An ordinary travelling 'Rob Roy' canoe weighs about 70 pounds, and will float with its paddle and 10 pounds of luggage in 5 inches of water. The 'Rob Roy' is generally built of oak, with a cedar deck.



Types of Canoes

a. Ancient dug-out (British Museum). *b.* Eskimo kayak. *c.* Kootenay Indian birch-bark canoe. *d.* Canadian birch-bark, or wood canoe. *e.* Solomon Islands canoe. *f.* Vanatahi canoe, Paumotu Archipelago. *g.* 'Rob Roy' canoe. *h.* Outrigger canoe, Pacific Islands. *i.* Peruvian canoe from Lake Titicaca, made of grass or palm and rope.

Canoes are built of many kinds of wood, but mahogany, cedar, and basswood are the favorites; many are made of paper and some of canvas especially treated to resist the action of the water. The birch-bark canoe of the Indian was the first type employed in America, and is still in use, although it has been generally supplanted by craft of lighter wood. It is sharp at both ends, has a rounded bottom with no keel, and is propelled by a single blade or half-paddle, although double-bladed paddles are used, mainly in racing, and a keel is sometimes provided for its stabilizing qualities. Canoes of this description are common on rivers, lakes, and streams in America, the type being varied according to the waters where it is to be used.

A good type of American paddling canoe for two men is one

16 feet long, 32 inches beam, 7½ inches freeboard, and 4 inches draught. It displaces about 480 pounds, of which 72 pounds would account for the canoe and her gear, and about 308 pounds for the crew, leaving 100 pounds for camping paraphernalia and other supplies. Generally the canoe is built for the owner, its size depending upon its use and the weight it will have to carry, the figure being brought as low as possible to provide for portages. Canvas-covered canoes are equipped with two cane seats but most all-wood canoes are not. The Indians knelt on the bottom of the canoe when paddling and this is probably the best method, but for long periods it often proves tiresome.

Racing canoes are built upon the plans of racing shells—with enough buoyancy to hold the paddler. Sailing canoes are constructed along the same lines as paddling canoes, but have cross beams to stand the strain of the masts and sails. The *sponson* is an ordinary canvas-covered canoe to which have been added air chambers on either side. It is especially adapted for sailing and for fishing.

The chief body of canoe organizations in America is the American Canoe Association, with geographical Divisions along the Atlantic coast. Each Division has its annual meet and races, while the Association has a two weeks' encampment each year among the Thousand Islands on the St. Lawrence, with sports and races.

Consult MacGregor's *A Thousand Miles in the Rob Roy Canoe*, *Rob Roy on the Baltic*, and *Rob Roy on the Jordan;* Baden-Powell's *Canoe Travelling;* Steele's *Canoe and Camera;* Miller's *The Boys' Book of Canoeing and Sailing* (1917); Jessup's *The Boys' Book of Canoeing* (1926).

Can'on, in ecclesiastical usage a rule of faith or practice, established by competent authority. The body of these rules constitutes the Canon Law (q.v.) of the Roman Catholic Church.

The *Canons of the Church of England*, 141 in number, were framed at the Hampton Court Conference (1604). In 1640 they were revised by Convocation and seventeen new canons were added. The Book of Common Prayer as revised in 1661 and legalized by the Act of Uniformity under Charles II. (1662) is the latest rule of church order and discipline of the English Church. The canons therefore must be interpreted by its rubrics.

The *Scottish Book of Canons* is a code issued by the bishops in Scotland under mandate of Charles I. After being revised by Archbishop Laud and confirmed by letters-patent under the Great Seal (1635), they were published at Aberdeen in 1636. This code limited the power of the church courts so far as to make their findings subject to the bishop's ratification, while it also asserted the king's supremacy in matters ecclesiastical.

The term canon is also applied to any official church list, as of those worthy of commemoration in the liturgy (whence the term canonization, q.v.), and to a class of long and elaborate hymns used in the Greek Church at the morning service, founded mainly on the Old Testament canticles.

For the canon of the mass, see MASS, and for the canon of Scripture, the authoritative list of books constituting the Bible, see BIBLE.

Canon, a member of the chapter of a cathedral or collegiate church, living in a community under definite rules. The organization of the clergy of a see into a community dates from the fourth century, and the formulation of a rule of life from the eighth, when Chrodegang, bishop of Metz, drew up a clearly defined set of rules for his clergy. This rule was adopted by other cathedrals and formed the basis of the rule for canons adopted in 816 by the Council of Aix-la-Chapelle. Thereafter it became a common practice for large and important churches (not cathedrals) to adopt an organization similar to that of the cathedral chapter. Such churches were termed 'collegiate churches.' The rule was also adopted by certain bodies of regular canons, unconnected with any cathedral or collegiate church, who formed (1067) what was practically a new monastic order, living in 'houses' of their own. Owing to their strict adherence to the teaching of St. Augustine, these became known as Augustinian canons. In the British Isles, at the time of the Reformation, they possessed nearly two hundred and sixty houses in Ireland, over two hundred in England, and twenty-five in Scotland.

The canons attached to wealthy cathedrals and collegiate churches had by the 11th century, and indeed considerably earlier, largely given themselves up to lives of dignified ease. Papal edicts were issued in 1059 and 1063, binding them to a community life and the renunciation of private property. Following the Reformation most of the old foundations disappeared, the Lateran Canons and Premonstratensians being the chief who still exist. After the church attained to wealth and power, canons were often chosen for their administrative abilities; and even after the decay of the canons regular, canons secular were still deemed necessary for the administration of church property, not only in the Roman Catholic Church, but also in the Protestant Episcopal churches. The name is now applied to certain clergy who form a sort of council to the bishop and perform certain duties in the cathedral church.

Canon, in music, a species of composition written strictly according to rule—whence the name. A canon may be composed in two, three, or more parts, and invariably consists of a melody executed by one part, and imitated, note for note, by another part, beginning some beats later at either the same or a different pitch. More 'canons' than one may be maintained at the same time, and they are applicable to both vocal and instrumental music. Canonic imitation first appeared in the compositions of the 12th century. For examples, consult Purcell's *Gloria Patri* in his Collection; also Ouseley's *Treatise on Counterpoint, Canon, and Fugue.*

Cañon, kan'yun, or CANYON, a name signifying 'a gorge,' applied originally to the deep, narrow gorges in the Western United States, cut by rivers in the solid rock, the most notable example being the Grand Cañon of the Colorado. The causes which have produced these remarkable gorges include, in addition to the cutting action of the streams, first, a process of continuous uplift, which has maintained the rapid flow of the river, and counteracted its deepening action; second, the arid climate, which has prevented the disintegration of the rocky walls by frost and springs, and maintained their vertical character. See GRAND CAÑON OF THE COLORADO.

Cañon City, city, Colorado, county seat of Fremont county, on the Arkansas River, and on the Atchison, Topeka and Santa Fe and the Denver and Rio Grande Railroads; 90 miles southwest of Denver. It is beautifully situated at the mouth of the Grande Cañon of the Arkansas, at an altitude of 5,343 ft. The city has a public library, is the seat of the State penitentiary and State armory and has rich coal mines in the neighborhood. It is also an agricultural, horticultural, and live-stock centre. Its zinc-lead smelting works are among the largest in the world. Manufacturing industries include a publishing and printing plant, a large light and power plant, gas plant, canning factories, creameries, foundry and machine shop, artificial ice plant, bottling

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THE GRAND CAÑON OF THE COLORADO

works, stone quarries, cement plants, and pressed brick factories. Hot mineral springs and mild climate make the city an important health resort. Pop. (1910) 5,162; (1920) 4,551.

Can'oness, originally a woman who took a vow to remain unmarried and gave herself to good works, living in her own home. Later the church permitted and encouraged women to associate themselves under rules somewhat similar to those of canons and eventually two great sections developed, regular and secular. The regular canonesses practised a life of austerity and poverty, but the secular canonesses were allowed to possess property to an unlimited extent, and their duties consisted merely in instructing young girls in such accomplishments as the arts of illuminating missals and ecclesiastical embroidery. Indeed, from the time of its inception, during the reign of Louis le Débonnaire (778–840), down to the Reformation, this order was for the most part rather a retreat for women of good birth than a truly conventual order. Many chapters of the secular canonesses became Protestant at the Reformation (*e.g.* those of Gandersheim and Quedlinburg in Germany), and continued to exist with little alteration from their former life.

Canon'ical Hours, certain hours of the day set apart by church canon for prayer and devotion. These hours were eventually arranged as follows: Prime, 6 A.M.; Tierce, 9 A.M.; Sect, at noon; Nones, 2 or 3 P.M.; Vespers, about 4 P.M.; Compline, 7 P.M.; Matins and Lauds, at midnight or daybreak. In the Church of England the term refers to the time during which marriage may be legally solemnized: *i.e.* 8 A.M. to 3 P.M.

Canoniza'tion, the formal process by which the Roman Catholic Church bestows on a person the title of 'saint' and enrolls his or her name on the list of saints, the *Canon Sanctorum.*

In the primitive Christian church the germs of the modern custom are to be found in the honors publicly paid to the martyrs. For many centuries the appellation of saint was given to individuals by popular acclamation. Martyrologies, menologies, calendars, and the like, were composed, which gave with more or less discernment and authority the names of the generally acknowledged saints, while it would fall to the bishop to decide to whom he should assign a feast-day or ritual commemoration within the limits of his own jurisdiction.

It was not until a comparatively late period that a regular form of procedure equivalent to canonization was adopted. The earliest acknowledged instance of a solemn decree of canonization is that of Udalric or Ulric, bishop of Augsburg, declared to be a saint by John XVI. in 993 A.D. Alexander III. (1170) reserved the right of canonizing exclusively to the Holy See. Urban VIII., in two constitutions, 1625 and 1634, made more stringent regulations, and laid down the procedure in cases of canonization, which, with slight modifications, is in force at the present day.

In modern times the person who is thus honored must have first passed through the intermediate stage of beatification. This ceremony, which takes place publicly in St. Peter's at Rome, after a lengthy and minute inquiry into the life of the candidate, and conclusive proof that he has worked miracles, consists of the solemn publication of the decree by the Pope. After at least two miracles performed subsequent to beatification, and a further searching inquiry, canonization may follow, an interval of at least fifty years between canonization and death being generally insisted on.

The miracles alleged to have been wrought through the intercession of the beatified one are subjected to the keenest scrutiny, and any doubt attaching to them is dwelt upon by the *promotor fidei* (popularly known as *advocatus diaboli*, 'the devil's advocate'). The question is then considered by three successive 'congregations' over the last of which the Pope presides; and a form of decree is drawn up authorizing the crowning act of canonization. This high ceremonial is proceeded with in St. Peter's, in the presence of the Pope, the Sacred College, other dignitaries of the church, and the clergy and people. A day is also fixed for the annual commemoration of the saint. The standard work on this subject is the *De Beatificatione . . . et Canonizatione Beatorum* (1766) of Pope Benedict XIV. (Prospero Lambertini).

In the Greek Church the ceremony of canonization takes place in the presence of the Patriarch, who causes the testimony of witnesses to be examined in a synod of bishops assembled for that purpose, but the ceremony is seldom performed.

Canon Law, in the Roman Catholic Church the body of church laws. The word 'canon' was first applied to the injunctions of the founders of Christianity and to matters of common consent, and later, also, to the decrees of councils and of the Popes. The first collections of canons were Greek. One of the earliest is the so-called *Apostolic Canons*, consisting of eighty-five precepts and rules usually appended to the eighth book of the *Apostolic Constitutions.* They range in date from the second to the fifth century and certainly are not of apostolic authorship. About 500 Dionysius Exiguus of Rome translated fifty of the *Apostolic Canons* into Latin and added about 200 canons of councils. He also made a collection of papal decretals and the two works united for a time passed as the authoritative collection of the Western Church. About 1140 Gratian, a monk and teacher of law at Bologna, compiled his *Decretum*, which soon superseded all earlier efforts. In course of time it became customary to join with the *Decretum* four other works, viz.: the *Decretals* of Gregory IX. and of Boniface VIII., the *Clementine Constitutions*, and two books of *Extravagantes*, the whole constituting the *Corpus juris canonici.* This is frequently meant when reference is made to the canon law. But it should be borne in mind that many different collections were used at different times and in different places and the issue of new decretals and inevitable developments soon made any particular attempt at codification incomplete.

The Canon Law has naturally been of the greatest importance in Roman Catholic countries, but its influence on the legal systems of other countries and on international law has been great.

The best edition of the *Corpus* is Friedberg's (2 vols., 1879–81). Consult, also, histories of the canon law by Schulte (3 vols.) and Hinschius (4 vols.), the English translation of *Apostolic Canons* by T. MacNally, and Mansi's collection of the canons of councils (31 vols., 1759–98).

Can'onsburg, borough, Pennsylvania, in Washington county, on Chartier's Creek and on the Pennsylvania Railroad; 19 miles southwest of Pittsburgh. Its industries include steel mills, potteries, bridge works, and a can factory, and there are large mines within a radius of a few miles. The Pennsylvania Training School known as Morganza is a mile from the city. Canonsburg was founded in 1802, and was formerly the seat of Jefferson College, until its union with Washington College (see WASHINGTON AND JEFFERSON COLLEGE). The 'Old Black Horse Tavern,' which was recently torn down, was the home of the Whiskey Rebellion. Pop. (1910) 3,891; (1920) 10,632.

Cano'pus, a lustrous southern star in the constellation Argo, about half a magnitude fainter than Sirius. It is immeasurably remote, and must accordingly be of prodigious real magnitude. Its spectrum is of early solar type.

Canopus, ka-nō′pus, an ancient town in Egypt, about 15 miles northeast of Alexandria. It was near the modern Aboukir and the westernmost mouth of the Nile, hence called the Canopic mouth. The town was famous for a temple of Serapis, and for its luxury, and was a favorite resort of the Alexandrians. Canopic vases, with tops shaped like human heads, to hold the viscera of embalmed bodies, were manufactured here.

Can′opy, the protecting covering held over the heads of monarchs and other dignitaries, or the covering suspended over a bed. In architecture the term indicates the stone 'awning' erected over a tomb or seat, the roof-like ornament surmounting a niche, or the decorative mouldings over a door or window.

Canosa, kä-nō′sä, town, Italy, in the province of Bari; 16 miles southwest of Barletta. It is the seat of a cathedral of Byzantine style, with interesting columns and a richly carved pulpit. There is trade in oil and wine. As Canusium, Canosa was in early times one of the chief commercial towns of Italy. Pop. (1921) 26,172.

Canossa, kä-nos′sä, village, Italy, in the province of Reggio nell' Emilia, 14 miles southwest of Reggio, is famous for its castle (now in ruins), where the German Emperor Henry iv. (q.v) humiliated himself before Pope Gregory vii. in 1077.

Canova, kä-nō′vä, Antonio (1757–1822), Italian sculptor, reviver of the classic school, was born in Possagno, near Venice. He received instruction in the use of the sculptor's tools from his grandfather and worked under the Venetian sculptors Torretto and Ferrari. His first works, executed when he was still in his teens, were statues of *Orpheus* and *Eurydice*, now preserved in the palace at Asolo. The best work of this early period is his *Dædalus and Icarus*, in the Venetian Academy. In 1780 Canova went to Rome, where he soon became imbued with enthusiasm for classic antiquity, applying himself zealously to the antique and producing, among other groups, *Theseus Vanquishing the Minotaur*, *Psyche and the Butterfly*, several representations of *Cupid and Psyche*, and *Venus and Adonis*. In 1798 troubled conditions in Rome led him to spend several years in travel with his friend and patron Prince Rezzinoco. On his return he executed *Perseus with the Head of Medusa* for the Vatican, *Venus*, and the *Three Graces*. In 1802 and 1810 he was in Paris, where he modelled various statues of Napoleon and his family, and in 1815 he was sent to France as emissary of the Pope to seek the return of art treasures removed by Napoleon. As a reward for his successful accomplishment of this mission, he was made Marquis of Ischia.

Besides the works already spoken of, may be mentioned the following, which include some of the sculptor's most celebrated works: *Mars and Venus; Hebe*, of which he made various replicas; the monument to Maria Christina, Archduchess of Austria; *Pius VI.; Hercules and Lichas; The Kneeling Magdalen;* a statue of George Washington, and many portrait busts of contemporaries.

Canovas del Castillo, kä′nō′-väs del käs-tēl′yō, Antonio (1828–97), Spanish statesman and historian, was born in Malaga. At an early age he became interested in politics and was a member of the Cortes (1852), director-general of the administration (1858–61), and minister of the interior (1864). He was banished after the revolution of 1868 but returned in 1869 and was one of the leaders in the movement to put Alfonso on the throne. He became premier in 1875 and held that office with various intervals until his assassination by an anarchist in 1897. He was a member of the Spanish Academy from 1865, and from 1890 onwards edited and directed the publication of the co-operative *Historia general de España*. Among his works are *Estudios literarios* (1868), *Problemas contemporâneos* (1884), *Estudios del reinado de Filipe IV.* (3 vols. 1888–90). Consult Creux's *Antonio Canovas* and Pons y Humbert's *C. del Castillo.*

Canrobert, käṅ-rō-bâr′, François Certain (1809–95), marshal of France, was born in St. Céré. He entered the army in 1828 and distinguished himself in the Algerian wars (1835 and 1841–51). Upon the outbreak of the Crimean War he commanded the first division of the French army, and on the death of Marshal St. Arnaud became the French commander-in-chief. He was twice wounded at the battle of the Alma, and again at Inkerman, but he completed the lines of investment at Sebastopol. Owing, however, to differences with Lord Raglan, he resigned his command in May 1855. In the Italian war he was present at Magenta and Solferino (1859), and in the Franco-German War (1870) commanded the Sixth Army Corps, sustaining the disastrous defeats of Wörth and Gravelotte. Besieged in Metz with Bazaine, he shared in the surrender, and was imprisoned in Germany. After the war he entered political life and became a Senator. Consult *Biographies*, in French, by Martin and Bapst.

Canso, a cape at the northeastern extremity of Nova Scotia, on the south side of Chedabucto Bay. The town of Canso (pop. 1,600) is the western terminus of several Atlantic cables.

Canso, Strait of, a body of water, about 17 miles long, connecting the Gulf of St. Lawrence with the Atlantic Ocean and separating Nova Scotia from Cape Breton Island.

Cant, generally a corner, angle, or niche. In architecture, it indicates the corner of a square cut off octagonally. In building, a cant brick is one cut on the splay. In nautical language, it describes a tilt or inclination, or ship's timber near the bow or stern, lying obliquely to the keel.

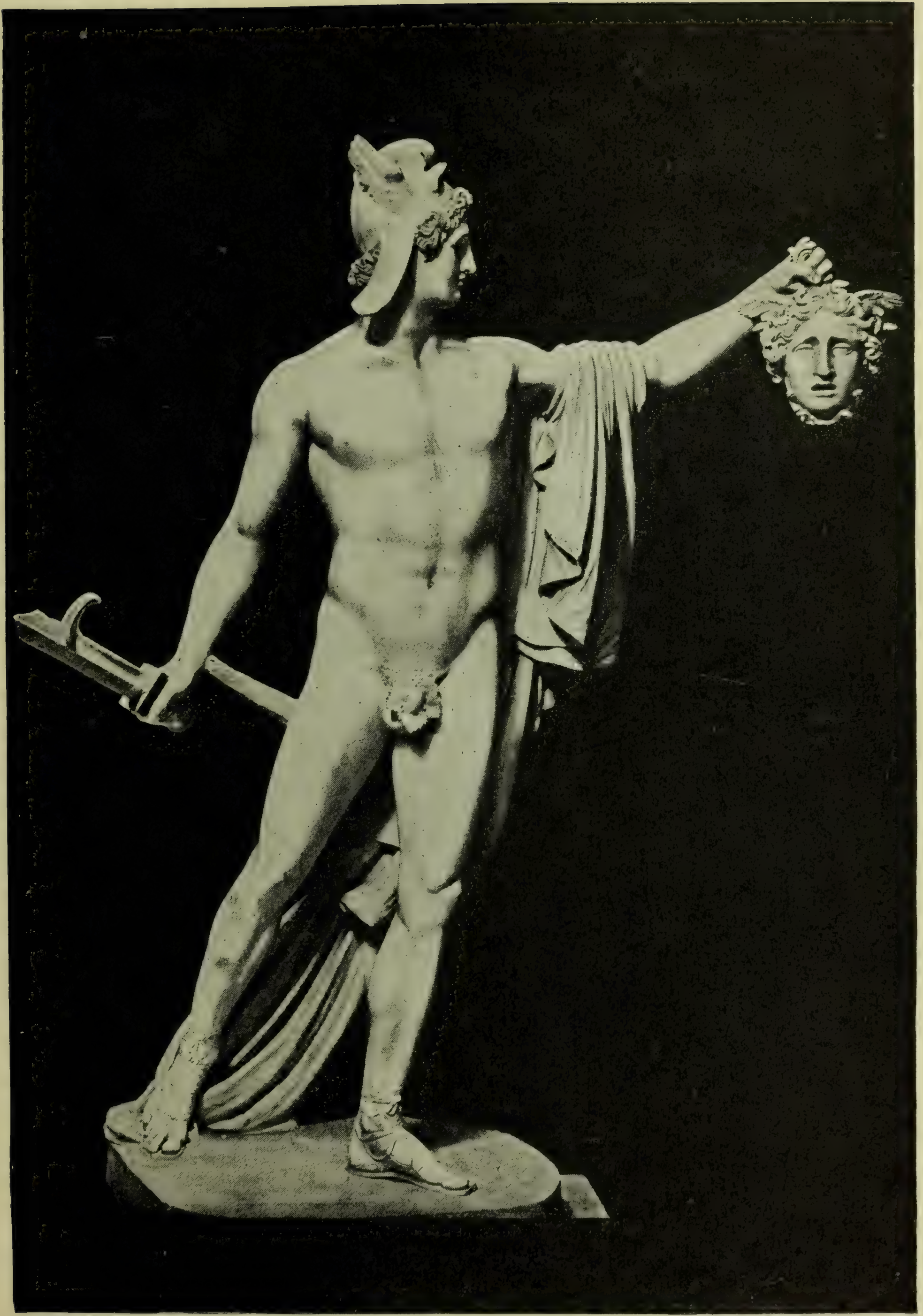
Cantab. (*Cantabrigiensis*), of Cambridge, England.

Cantabile and **Cantilena,** kän-tä′bē-lā, kän-tē-lā′nä, musical terms denoting a smooth-flowing, sustained method of performance, as contrasted with the interchange of *fortissimo* and *pianissimo* passages.

Cantabria, the name applied in ancient times to a district of Spain on the southern coast of the Bay of Biscay. It was the home of the Cantabrians (q.v.).

Canta′brian Mountains, a chain of mountains, an offshoot of the Pyrenees, in the northern part of Spain, extending for about 375 miles eastward from Cape Finisterre to the western end of the Pyrenees. They reach their greatest height, 8,700 feet, on the border of Asturias and León. They are rich in coal and iron. Different portions of the range have particular local designations.

Cantabrians, or Cantabri, the name applied in ancient geography to the inhabitants of the part of Spain lying to the south of the Bay of Biscay (the *Mare Cantabricum* of that people), and corresponding more or less closely to the modern provinces of Asturias, Santander, Viscaya, and Guipuzcoa, though it was latterly restricted to Asturias and Santander. They were brave and martial in character and though compelled to acknowledge the supremacy of Augustus (25 b.c.), and defeated by Agripps, they were never completely subjugated. The Basques claim descent from this brave people.



PERSEUS WITH THE HEAD OF MEDUSA

The famous statue by Canova in the Vatican Museum

Cantabricum Mare, ancient name of the Bay of Biscay (q. v.).

Cantacuzenus, kan-*ta*-kū-zē'nus (*c.*1292-*c.*1380), John VI., emperor of the East, was born in Constantinople. He was prime minister under Andronicus the younger in 1328, and in 1341 became regent for John Palæologus. He subsequently seized the throne (1342), and after six years of civil war, was recognized as joint-emperor with Palæologus. In 1354 a popular revolt in behalf of Palæologus forced Cantacuzenus to resign, and he retired to a monastery, where he wrote the history of the empire from 1320 to 1360.

Cantagallo, kan-ta-gäl'lo, town, Brazil, in the state of Rio de Janeiro; 100 miles northeast of Rio de Janeiro. The chief products are coffee, sugar, and salted meats. Pop. (1921) 29,856.

Cantal, kän-täl', department of Central France, in the former province of Auvergne; area 2,229 square miles. The centre of the department is occupied by a large volcanic mass, the culminating point being Plomb du Cantal (6,095 feet). From this mass flow, north and west, the rivers Dordogne and Truyère. The northeast of the department is drained to the Loire basin. The chief products are rye, buckwheat, potatoes, and chestnuts. The natural beauties and the numerous mineral springs attract many tourists. Coal, marble, and antimony occur. Aurillac is the capital. Pop. (1921) 199,402.

Cantaloupe. See MELON.

Cantarini, kän-tä-rē'nē, SIMONE (1612-48), known also as Simone da Pesaro, Italian painter and etcher, was born near Pesaro. He was a pupil of Guido Reni, and so closely imitated that painter that his works have sometimes been attributed to his master. His paintings deal chiefly with Scriptural subjects, but include, also, a fine portrait of Guido, in the Bologna Gallery. As an etcher his reputation is high.

Cantata, kan-tä'ta, literally a composition to be sung, as opposed to one to be played (sonata). The earliest form consisted of a recitative (developed from the early opera) given by one person to a simple accompaniment on lute, 'cello, harpsichord, or other instrument, the text being a short drama or story in verse. An advance in style was made by the addition of an air repeated more or less regularly, and two types became general—the *cantata da cheesa*, which had a sacred subject, and the *cantata da camera*, with a secular subject.

Whether or not Carissimi (q. v.) is the inventor of the cantata, to him is due its transference, in the seventeenth century, to the church from the chamber. Showing a strong instinct for treating the voice instrumentally, he brought to the cantata new brilliance and expressiveness, through a freer type of melody and variety of accompaniment. Other writers of the period who improved upon the recitative were Lotti, Marcello, Gasparini, and Cesti.

The beginning of the eighteenth century saw the development of a more extended form, in which various movements were incorporated. Domenico Scarlatti and Pergolesi produced splendid works, of which the latter's *Orfeo ed Euridice* is perhaps most notable. The end of the line of composers using the single voice came with Handel, whose accompaniments included strings and oboes. A special form developed in the church-cantata of Germany, created with a congregational participation in mind. Vocal resources were expanded, several movements were used, and the chorus was an important feature. The organ, alone or with some orchestral groups, furnished the accompaniment. Cantatas were composed around certain church days and various other religious occasions, and a style resulted calling for church presentation only. Bach enriched the literature by a long list of church-cantatas, as noble in conception as they were masterful in execution. Other cantatas sprang up around individual characters, and from this to the larger occasional type in the national cantata was but a step.

The nineteenth century saw an enlargement of subjects for the cantata, due in part to the romantic elements in music, which began to be felt more strongly early in the century; while the presentation of more elaborate works became possible through the active work of numerous choral societies. To the names of composers already given, should be added, as significant contributors, Beethoven, Brahms, Mendelssohn, Schubert, Schumann, and Wagner (qq. v.).

Canteen', a soldier's wooden, leather, or metallic flask for water or other liquid, of about two to two and a half pints capacity. On the march it is carried slung over the shoulder or hooked to the waist belt. The canteen used in the United States Army is made of aluminum and is provided with a closely fitting, removable cover of heavy duck, lined with felt. An aluminum cup made to fit over the lower half of the canteen is also carried within this cover. In the British Army the canteen is a combination of pan, plate, or dish of tin covered with thin leather, and is carried strapped either to the knapsack or to the waist belt.

The word canteen is also applied to the store and recreation centre, officially known in the United States Army as the Post Exchange, established in every army garrison and governed by regulations of the War Department. The purpose of the Post Exchange is to serve primarily as a club for the enlisted men and as a store to furnish them and other military inhabitants of the post with various commercial articles at the lowest price consistent with good quality. It is managed on a co-operative basis under the direction of a commissioned officer detailed for that purpose, the profits being divided on a *pro rata* basis among the different organizations participating and used by them for the improvement of the enlisted men's messes and for similar purposes. Under special regulations of the War Department, the amount of a soldier's indebtedness to the Post Exchange may be charged against him and collected on the monthly pay rolls. The building in which the Post Exchange is housed is provided by the government and generally contains a gymnasium, reading rooms, restaurant, billiard and pool rooms, in addition to the co-operative store. Previous to 1901, the sale of beer and light wines, but not of spirituous liquors, was permitted in the Post Exchanges; in that year the anti-canteen law, forbidding their sale, went into effect.

In the British army there is a canteen in every post and camp. It is divided into two parts: the wet canteen, where private soldiers can purchase ale, beer, and mineral water, and the dry canteen for the sale of groceries.

Cantemir, kän'tye-mēr', or KANTEMIR, ANTIOCHUS DMITRIEVITCH (1709-44), Russian satirist and diplomatist, son of Dmitrii Cantemir (q. v.), was born in Constantinople. In 1730 he was appointed Russian ambassador to London, and in 1738 to Paris. He wrote several poems of a pungently satirical type, translated into Russian the *Satires* of Boileau, Montesquieu's *Lettres Persanes*, and many classical works, and may be considered to have introduced the pseudo-classical spirit and ideals into Russian literature.

Cantemir, DMITRII (1673–1723), prince of Moldavia, and Roumanian historian. In 1687 his brother Antiochus became prince of Moldavia, and Dmitrii was sent as a hostage to Constantinople, where he seized the opportunity to learn the chief

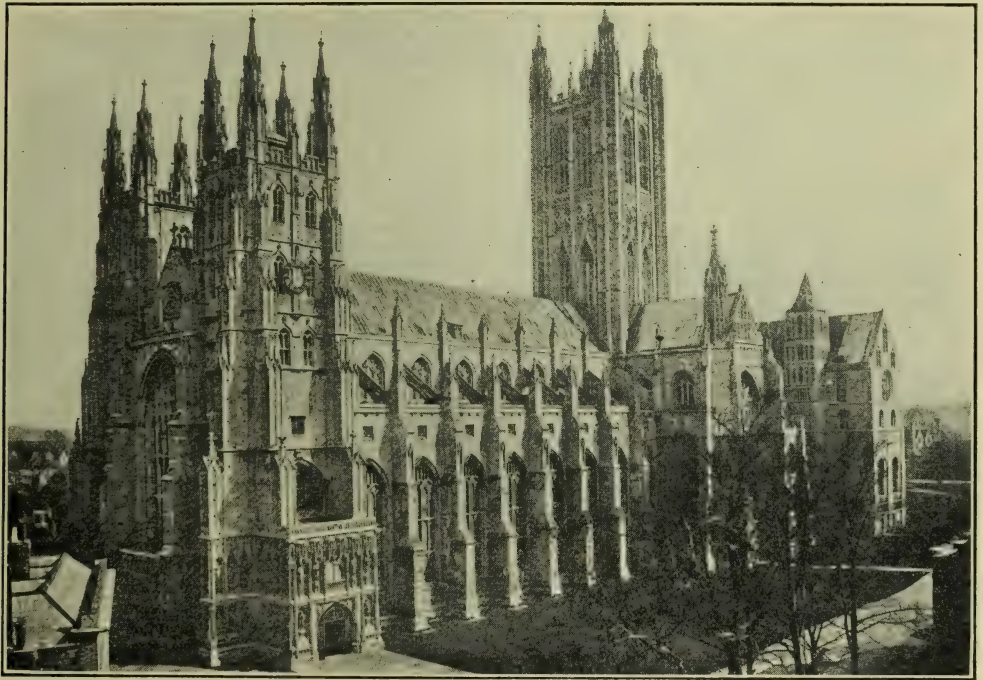
Oriental languages (Turkish, Arabic, Persian), and to study Turkish history. At the beginning of the war with Russia (1710), he was sent to Moldavia, where he betrayed the interests of the Porte and formed an alliance with Peter he Great. The disastrous defeat of Peter at the Pruth (1711) forced him to fly to Russia, where he received high favors from the tsar. Among his numerous works, written in Roumanian, Latin, Greek, and Turkish, are *History of the Growth and Decay of the Othman Empire* (Eng. trans. by N. Tindal, 1756), *Moldaviæ Descriptio* (1769), and *Cronica Moldo-Valachiei* (1837). His works were published in Roumanian, in 7 volumes (1872-83).

Canterbury, kan'ter-ber-i, city and municipal and parliamentary borough, England, in Kent, famous as the ecclesiastical metropolis of England; 55 miles southeast of London. It is pleasantly situated in a valley watered by the Stour. The main feature of the town is the Cathedral, on the site of the ancient monastery church of St. Augustine destroyed by fire in 1067. The most ancient parts now extant are fragments of the edifice erected by Archbishop Lanfranc (1070–89); his successor, Anselm, rebuilt the eastern end, and Prior Conrad nearly doubled the building's area. In 1174 a fire partially destroyed it, but the following year rebuilding was commenced and by 1180 the east transepts, St. Thomas' Chapel, Becket's Crown, and the crypt were completed. In the fourteenth century the old nave was pulled down and the present nave and transepts built, and the following century additional chapels and the beautiful central tower, known as Bell Harry or the Steeple, were erected.

The cathedral, as reconstructed, is a magnificent double cruciform structure, 545 feet long and 156 feet broad at the eastern transepts. The nave is well lighted and stately; an elaborate fifteenth-century screen separates it from the choir. The northwest transept, the scene of the murder of Thomas à Becket, known as the Martyrdom, contains a small stone slab to mark the spot where the archbishop is said to have fallen. To the east of this transept is the Lady Chapel, a late Perpendicular building with rich fan-vaulted roof. East of the choir, behind the high altar, is Trinity Chapel, which formerly contained the shrine of Thomas à Becket, demolished by Henry VIII. in 1538; and at the easternmost end is the circular chapel called the Corona or Becket's Crown in which the martyr's skull is said to be preserved. The Corona also contains the ancient stone chair used at the enthronement of all bishops. The spacious crypt, dedicated to the Virgin, contains a stone coffin said to hold the bones of à Becket. Its south aisle is walled off to form a temple for the French Protestants who have worshipped there since 1568.

The cathedral contains many interesting and notable monuments, chief among which are the coffin of Stephen Langton; the tombs of Edward the Black Prince and of Henry IV. and his queen; the tomb of Cardinal Pole, the last Roman Catholic archbishop; and the memorial to Archbishop Benson (d. 1896). Adjoining the cathedral on the west and northwest are extensive monastic buildings, the cloisters, library, chapter house, and deanery. A little to the east is St. Augustine's College, a missionary training school, occupying some of the restored buildings of St. Augustine's ancient monastery.

Other features of interest in the town are the remains of the ancient city wall and gates; the Beaney Institute, in which are the town museum, library, and art collections; the Guildhall; St. Martin's Church, parts of which date from the fourth cen-



Canterbury Cathedral

The fine central tower, known as Bell Harry or the Angel Tower, is 234 feet high.

tury; the Hospital of St. Thomas; and several mediæval houses. Canterbury is an important British military station, the home of the cavalry school and riding establishment of the army.

A town or settlement appears to have existed here previous to the Roman invasion. St. Augustine founded a priory and an abbey (605) at Canterbury, and upon his designation as archbishop, established his seat here. The city was taken by the Danes in 843, 852, 918, and 1011, when 43,000 persons are said to have perished. Canute assisted in rebuilding the town, which at the time of the Conquest enjoyed a high reputation. The most notable event in the history of the cathedral and of the city was the murder of Archbishop Thomas à Becket (q. v.) in 1170, and the subsequent penance performed here by Henry II. In the reign of Queen Elizabeth, Walloons settled in Canterbury and introduced silk-weaving; on the revocation of the Edict of Nantes, in 1685, they were joined by French Huguenots. Pop. (1921) 23,738.

Consult Dean Stanley's *Historical Memorials of Canterbury;* Withers' *The Cathedral Church of Canterbury*, in Bell's' Cathedral Series'; Willis' *The Architectural History of Canterbury Cathedral.*

Canterbury, district, South Island, New Zealand, with an area of 13,858 square miles. It is a rich agricultural and pastoral region. The principal products are wool, grain, frozen and preserved meat, skins, hides, leather, butter, and cheese. Christchurch is the capital and Lyttelton the chief port. Canterbury was founded in 1850 by a band of colonists, all members of the Church of England. Pop. (1921) 199,034.

Canterbury, Archbishop of. See Archbishop.

Canterbury Bell. See Campanula.

Canterbury Tales. See Chaucer.

Cantharides, kan-thar'i-dēz, zoologically the name of a subfamily of the Cantharidæ, or Blister Beetles, to which *Cantharis* or *Lytta vesicatoria*, the 'Spanish fly,' belongs. The blister beetles are remarkable not only for the vesicating properties of the substance which can be extracted from their bodies, but also on account of their life history, which is singularly complicated. *Epicauta vittata*, an American cantharid, which lives on the eggs of locusts, displays no less than eight stages in development, including two pupal. In Europe species of the genus Meloë are common, the larvæ feeding on bees' eggs, and later on honey. The blistering fluid apparently protects the beetles from the attacks of insect-eating animals.

Cantharides are used in medicine for blistering purposes, as a counter-irritant in neuralgia, and internally, in small doses, as a diuretic and stimulant to the urinary and reproductive organs. Taken internally, in large doses, they are extremely poisonous. Symptoms of poisoning, though in a minor degree, may also come on after too free blistering. The drug is prepared from the beetle *C. vesicatoria*, which is collected chiefly in Hungary, killed in vinegar, dried, and pounded. There are several officinal preparations.

Can'ticles, commonly called the Song of Solomon, or Song of Songs, a short book of the Hebrew Scriptures, one of the five Megilloth, or Rolls. Apparently an erotic lyric, its admission into the Hebrew canon of Scripture was secured only after much controversy as to its real meaning, and to this day its interpretation is a matter of debate. The Jewish rabbis and the early Christian exegetes (*e.g.* Origen) generally regarded it as an allegory, intended to express Jehovah's love to Israel or Christ's to the church ('the bride') in the language of human affection. This view has still its adherents. At present, however, the literal interpretation holds the field, but in two forms: (1) the dramatic, according to which either two main characters, Solomon and the Shulamite maiden, or three (the shepherd lover being added) are represented—held by Delitzsch and Ewald respectively; and (2) the lyrical, developed mainly by Karl Budde, who understands the Song as a collection of nuptial lyrics, like those used among the Syrian peasantry at the present day: the married pair are king and queen for the marriage week. The former hypothesis, emphasizing the dignity and value of true and chaste love, leaves the booklet a legitimate place in the canon. Many passages are of extraordinary literary beauty—e.g. viii. 6–7. The presence of foreign words in the Song indicates a date not earlier than the 3rd century B.C.

Consult Driver's *Introduction to Literature of the Old Testament.* for a full account of the dramatic hypothesis in both forms. Cheyne, in the *Encyclopædia Biblica* (subject 'Canticles'), sets forth the lyrical theory, and J. W. Rothstein, in Hasting's *Dictionary of the Bible*, iv. (subject 'Song of Songs') attempts to combine the two theories.

Cantilan, kan-te-lan', pueblo, Mindanao, Philippine Islands, in the province of Surigao, at the mouth of the Surigao River; 47 miles southeast of Surigao. Pilots are taken aboard here for Surigao Strait. Pop. (1918) 18,594.

Cantilena. See Cantabile.

Cantilever, kan'ti-lev-*e*r, essentially a bracket, or structure extending horizontally from a fixed base, by which alone it is supported. The principal characteristic from a technical standpoint, is the reversal of strains in the members of the cantilever structure as compared with those of the regular girder or truss, where the compression strain is in the upper parts and the tension strain in the lower, while in the cantilever the tension is on top and compression at the bottom. The jumping board on a bathing pier is a familiar example.

In architecture the cantilever is largely used for the support of balconies and other projecting portions of a building, filling often an important place also in the ornamental system of the structure. In modern railway stations the roofing of island platforms, the so-called 'umbrella' sheds, is frequently carried on light steel cantilevers, obviating the use of pillars or other supports where they would be more of an obstruction to the traffic. Some of the earliest known bridges, of a span too great to be crossed by a single log, were constructed on the cantilever principle, examples of this type existing at the present day in India and Japan. A balk of timber was laid on either bank, projecting over the stream, the landward ends being securely embedded in banks of earth or walls of masonry. A third timber rested on the free ends of each, connecting them and forming the bridge.

In modern engineering practice the cantilever principle is adapted in bridging spans too great to be conveniently crossed by girders alone, and for which the suspension system would not be suitable. For instance, on the Forth Bridge, Scotland, each pier supports two cantilevers, which stretch out horizontally on either side and balance each the weight of the other, the outer ends being connected by short girders at the centre of every span. The bridge over the Indus at Sukkur, on the other hand, reverts more in principle to ancient forms of design, its cantilevers extending from either bank, and depending for their stability on holding-down chains to the ground behind. (See Bridges.)

In the United States a striking example of cantilever construction is found at the great race tracks at Monmouth Park, N. J., where the roof over the grand stand is built after the cantilever principle.

Cantire. See Kintyre.

Canto Fermo. See Plain Song.

Canton, in Heraldry, one of the subordinaries. See Heraldry.

Can'ton', in Switzerland (q.v.), a geographical administrative area or state having its own laws and a local government which deals with domestic affairs. In France (q. v.) the term is applied to a subdivision of the arrondissement.

Canton (Chinese *Kwang-chau-fu* or *Sheng-cheng*), city, China, capital of the province of Kwangtung, and the first Chinese port to be opened to European trade, is situated on the Pearl River; 70 miles north of Macao, and 90 miles northwest of Hong-kong. It is surrounded by walls of brick and sandstone and by a moat about 6 miles in circumference; it is, moreover, divided by a second wall, running east and west, into two unequal parts—the Old or North City, and the smaller New or South City.

Without the walls, on either side of the river, are the suburbs, while banked along the stream lie thousands of sampans or native water craft, on which a great part of the native population make their permanent homes. South of the western suburb, and separated from it by a canal crossed by two bridges, is *Shameen*, the foreign residence section and the seat of the chief consulates.

Since 1917 Canton has had an up-to-date tram system, and considerable expenditures have been made for street improvements. The city has an electric lighting plant, Chinese owned, a Water Supply Company capable of handling 7,000,000 gallons of water daily, and telephone service. A number of modern European buildings have been constructed, including a large department store. Many of the streets, however, are narrow and crooked, lined with low, red-roofed structures of brick, stone, or wood. Overtopping these are the Plain Pagoda, erected as a Moslem Mosque more than a thousand years ago; the Flowery Pagoda; the Gothic shafts of the French Roman Catholic Cathedral; and the towers of the numerous pawnshops. There are a large number of temples, of which the most famous is the Buddhist Temple on the Island of Honan. Missionary enterprises include the famous Canton Christian College, the Medical Mission Hospital, and numerous schools and theological seminaries.

Many distinctively Chinese industries are carried on in Canton, notably the making of blackwood furniture, tortoise-shell and lacquer ware, stoneware, fans, and pottery. Silk, cotton goods, embroideries, paper, tea, and metal ware are also manufactured.

Canton was formerly the chief commercial city of China; but with the opening of other ports and with the development of Hong-kong it has declined in importance, though it has still a large trade. In 1919 the total value of the foreign trade was $111,749,151, of which $47,073,094 represented imports and $64,676,057 exports. The principal articles of export are raw and waste silk, leather, firecrackers and fireworks, matting, cassia, tea, and tobacco. Imports include cotton goods, metals, kerosene, cigarettes, opium, rice, sugar, and salt fish. Pop. (1920, est.) 1,367,680.

History.—The history of Canton dates back to several centuries before the time of Christ. Foreign traders appear to have visited it as early as the eighth century A. D.; and in the seventh century the East India Company, following in the wake of Portuguese, Spanish, and Dutch traders, established a monopoly of the foreign trade which lasted until 1834. The attitude of the natives toward foreigners brought a declaration of war by Great Britain in 1839, and the city was invested in 1841; but it was saved from attack by payment of a heavy ransom, and in 1842 was named as one of the five treaty ports. It was again attacked in 1857, and was occupied by a French and English garrison until 1861; since that year it has been open to all nationalities.

Canton, town, Connecticut, Hartford county, on the Farmington River, and the Central New England Railroad; 15 miles northwest of Hartford. It has manufactures of edge tools. Pop. (1910) 2,735; (1920) 2,549.

Canton, town, Illinois, Fulton, county, on the Toledo, Peoria, and Western, and the Chicago-Burlington, and Quincy Railroads; 28 miles west of Peoria. Farming implements, patent racks, marble tile and brick, brooms, cigars, flour, cigar boxes, overalls and shirts, ice cream, sash, doors and other lumber products are manufactured, and there are foundries and machine shops. Coal mining is carried on. Pop. (1910) 10,453; (1920) 10,928.

Canton, town, Massachusetts, Norfolk county, on the New York, New Haven, and Hartford Railroad; 14 miles southwest of Boston. It is the seat of Massachusetts Hospital School. Woollen, rubber, and felt goods, sizing, stove and shoe blacking, and electrical supplies are manufactured. Pop. (1910) 4,797; (1920) 5,945.

Canton, city, Mississippi, county seat of Madison county, on the Illinois Central Railroad; 23 miles north of Jackson. The manufactures include lumber, brick, cotton gins and compresses, cotton-seed oil, and an ice factory. Cattle, hogs and sheep are raised. Pop. (1910) 3,929; (1920) 3,252.

Canton, town, Missouri, Lewis county, on the Mississippi River, and the St. Louis, Hannibal, Quincy, and Burlington Railroad; 125 miles northwest of St. Louis. It is the seat of Christian University (Christian). It has a large planing mill, button factories, canning and pickle works, and a creamery. Pop. (1910) 2,218; (1920) 3,252.

Canton, village, New York, county seat of St. Lawrence county, on the Grass River, and the New York Central Railroad; 18 miles southeast of Ogdensburg. St. Lawrence University (Universalist), Universalist Theological School, and State School of Agriculture are situated here. Foundry products, flour and feed are manufactured, and there is a large milk plant. Pop. (1910) 2,701; (1920) 2,631.

Canton, city, Ohio, county seat of Stark county, on the Baltimore and Ohio, the Pennsylvania, and the Wheeling and Lake Erie Railroads; 58 miles by rail southeast of Cleveland, and 101 miles east of Pittsburgh. The principal buildings and institutions include the Federal Building, City Hall, City Auditorium, County Court House, Aultman, Aultman Annex, and Mercy Hospitals, County Workhouse, County Home, and Public Library. There are public parks covering 173 acres, two monuments to the soldiers of the Spanish-American War, and a national monument to President McKinley, whose remains lie in the mausoleum in Westlawn Cemetery.

Canton is an important manufacturing city, its industrial establishments, according to the U. S. Census of Manufactures for 1919, numbering 287, with $102,977,000 capital, and products valued at $124,292,924. Leading articles of manufacture are steel and steel fabricated products, such as steel ceilings, roofing, furniture, enamelled ware, bridges, safes, roller bearings, and special machinery; brick and clay products; rubber sundries; watch cases and movements; electric sweepers; cutlery and castings of all descriptions. Shale of the finest quality for the manufacture of brick and tile, clay, limestone, and coal are found in the vicinity. The city was settled in 1805. Pop. (1900) 30,667; (1910) 50,217; (1920) 87,091.

Canton, city, South Dakota, county seat of Lincoln county, on the Big Sioux River, and the Chicago, Milwaukee, and St. Paul Railroad; 50 miles northeast of Yankton. It is the seat of Augustana College and the U. S. government asylum for insane Indians. It has grain elevators and manufactures ploughs, gasolene engines, and cement block machinery. Pop. (1910) 2,103; (1920) 2,225.

Canton, JOHN (1718–72), English electrician, was born in Stroud, Gloucester. In 1737 he settled as a schoolmaster in London, and becoming famous for his experiments in electricity, was elected a fellow of the Royal Society in 1749. He repeated and verified Franklin's experiments and hypotheses; invented an electroscope and an electrometer; originated experiments in induction; was the first to make powerful artificial magnets; and in 1762 demonstrated the compressibility of water. His name is associated with 'Canton's phosphorus,' discovered by him in 1768.

Canton'ment. In order to maintain the efficiency of a command, the troops composing it must have adequate shelter. Shelter for troops comes under one of the following heads: cantonment, camp, bivouac, or billet.

When troops are occupying buildings in towns or villages or huts specially constructed, they are in cantonments; if sheltered under canvas, they are in camp (see CAMPS); if resting upon the ground without shelter, they are in bivouac; and if assigned to public or private buildings as quarters, usually without disturbing the occupants and for a short period only, they are billeted (see BILLETING). As bivouacs are not resorted to except under emergencies, and billeting is not customary in the United States, temporary shelter for troops in the United States is either in camps or cantonments.

After the entrance of the United States into the Great War a number of cantonments were erected in all parts of the country for housing the army. The building of the cantonments was authorized in May, 1917; the last site was secured on July 6, and on September 4 accommodations were ready for 430-000 men. This capacity was shortly increased to 770,000, an average capacity per cantonment of 48,000.

The cantonments were laid out according to a general plan drawn up in the Quartermaster General's Office of the War Department. The buildings were standardized and of a size appropriate to the organization for which they were intended. The construction included two story barracks for the men and barracks for officers, offices, infirmaries, storehouses, bakeries, cold storage and ice plants, Y. M. C. A. buildings, hospitals, and water and sewer systems.

For the names and location of the National Army cantonments see CAMP, MILITARY.

Canton River (Chinese *Chu-kiang*, 'pearl river'), an arm of the delta of the Si-kiang, province of Kwang-tung, China, is formed by the Si-kiang and Pe-kiang Rivers. About 45 miles below Canton the river receives the name of *Boca Tigris* ('Tiger's Mouth'); here the entrance is guarded by the Bogue Forts, taken by the British in 1841 and 1856. It is the main approach to Canton and the total length is 100 miles.

Cantor. See PRECENTOR.

Cantù, kan-to͞o', CESARE (1804–95), Italian historian and novelist, was born in Brivio, near Milan, and was for a short time professor of the Italian language and literature at Sondrio, Como, and Milan. For strictures passed on the policy of the Austrian government, in his *Ragionamenti sulla Storia Lombarda nel Secolo XVII.* (1832–3), he was imprisoned, and during his detention wrote the historical novel, *Margherita Pusterla* (1838). His chief work, however, is his monumental *Storia Universale* (1836–42), in 35 volumes, of great polemic and literary value.

Canuck', a nickname in the United States for a Canadian; in Canada, used by the English for a French Canadian.

Canusium, Italy. See CANOSA.

Canute, ka-nūt', CNUT or KNUT, called THE GREAT (995–1035), King of England, Denmark, and Norway, was the son of Sweyn of Denmark. On the death of his father, during an invasion of England, Canute was proclaimed king of that country, but his supremacy was contested by Edmund Ironsides, son of Ethelred I., who was at that time a refugee in Normandy. In the struggle which ensued Edmund was betrayed by his own adherents, and a treaty was concluded whereby the northern part of the island was assigned to Canute and the southern part to Edmund. Within a short time, however, Edmund was treacherously assassinated, and Canute was proclaimed king of all England. On the death of his brother Harold, in 1019, he became king of Denmark also.

Up to this time Canute's reign was characterized by relentless cruelty and persecution but upon succeeding to the throne of Denmark he seemed to undergo a change of heart. He conciliated the higher clergy by his liberality, and secured his position still further by the creation of a standing army. The union with England was beneficial to Denmark, which borrowed clerks, scholars, and architects from the more civilized land to build churches and found schools. Canute overawed and partially subjugated the Wendish pirates; and when the kings of Norway and Sweden, profiting by his absence in England, invaded Denmark, Canute, hastening back, checked them at the battle of Helgeaa (1026). In 1027 he made a pilgrimage to Rome, and in 1028 invaded Norway, and added it to his dominions. He died at Shaftesbury, and was buried at Winchester.

Canute IV., called THE SAINT, king of Denmark (d. 1086), was elected king in 1080. He built many churches, including the Cathedrals of Roskilde and Lund, conferred many privileges upon the clergy, brought in foreign scholars to spread learning and culture, and endeavored to abolish serfdom. His rigorous rule finally provoked a popular rising, and he was murdered in St. Alban's Church, Odense, Denmark. He was canonized in 1101, and is regarded as the patron saint of Denmark.

Canvas, a strong, heavy cloth, made of cotton, flax, hemp, or jute. The fibres are spun and woven in the same way as linen (q. v.). Though canvas for sailcloth and tarpaulins is sometimes woven from cotton and other fibres, the finest and strongest kinds are made from flax.

Canvasback Duck (*Aythya vallisneria*), a fresh-water duck, widely distributed throughout North America. It breeds in Canada, and passes the winter in the United States, near the Great Lakes, in the Mississippi Valley, and especially around Chesapeake Bay. It is about 21 inches long; the head and neck are colored a dull reddish brown; the lower neck, breast, rump, and tail coverts are black; the back and sides gray, finely marked with wavy lines and dots, like coarse canvas. It greatly resembles the redhead duck (q. v.), from which it may be distinguished by its longer, darker head and wedge-shaped beak. It is highly prized for the table on account of its delicate flavor.

Canyon, or CAÑON, a deep gorge with steep sides. See GRAND CANYON.

Canzone, kan-tsō'nä, an Italian and Provençal form of poetry, used chiefly for love themes. The earliest Provençal specimens date from the twelfth century, those in Italian from the thirteenth. The number of stanzas varies, five or six being the most common, the last stanza invariably shorter than the others. The Provençals usually carried the same set of rhymes through all the stanzas; but the Italians mostly introduced fresh rhymes into each stanza. Dante, Petrarch, Tasso, and Leopardi all wrote in this *genre*. For the spread of the canzone from Italy see Provençal Language and Literature. In music, canzone and canzonet are songs in two or more parts.

Cao-Bang, kä'ō-bäng', or Kao-bang, district, Tong-king (q.v.), consisting of mountainous country, rich in forests and minerals; area about 3,000 square miles, and pop. about 70,000. The capital of the same name is 72 miles northwest of Lang-son. Pop. 6,000.

Caoutchouc, kōō'chōōk. See Rubber.

Cap. See Bonnet; Percussion Caps; Maintenance, Cap of.

Capacity, in electricity. See Electrostatics.

Capacity, in law, signifies the power of exercising legal rights. In strict language there is a distinction between the possession of such rights and the power of exercising them. A slave, for example, generally has no rights, while a free-born infant has rights, but is in the meantime unable to make use of them. This distinction was of importance in Roman law, but may now be neglected.

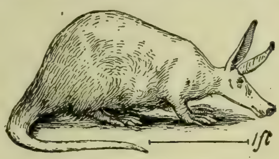
Incapacity may arise from youth, insanity, sex, coverture, alienage, conviction for crime, bankruptcy, and the like. The legal disabilities arising from sex and coverture and alienage have been largely removed by statute, though unnaturalized foreigners are not generally admitted to full political privileges. The rules governing legal capacity vary in relation to the matter in hand.

Capaneus, ka-pā'nē-us, Greek hero who took part in the first expedition of the Seven against Thebes. While attempting to scale the walls he was struck by lightning by Jupiter. Consult Æschylus' *Seven Against Thebes;* Euripides' *Phœnissæ*.

Cap-à-pie, kap'à-pē' (French, 'head to foot'), in the military language of the Middle Ages, a term applied to a knight or soldier armed at all points, or from head to foot, with armor for defence and weapons for attack.

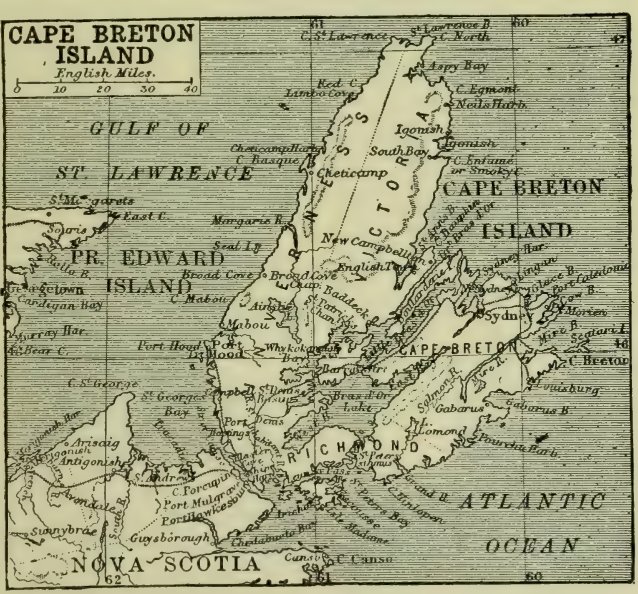
Cap de la Hague, kap de lä äg', promontory, France, in the department of Manche, forming the extremity of the peninsula of Cotentin. It extends into the English Channel about opposite the island of Alderney and protects the roadstead of La Hogue. This roadstead was the scene of a great naval battle between the French against the Dutch and English in 1692.

Cape. For articles on the prominent Capes, see the principal word, as Agulhas, Cape; Ann, Cape; Clear, Cape, and many others.



Cape Ant Eater

Cape Ant Eater, or Aardvark (*Orycteropus capensis*), a South African mammal usually placed in the order Endentata (q. v.); though it shows few obvious affinities with the typical members of that order. It is a nocturnal burrowing animal, feeding on termites and ants. It is ungainly and ugly in appearance; the teeth are numerous and complex, and are unlike those of any other mammal. The mouth is elongated and tubular, the tongue vermiform. A few bristly hairs are scattered over the surface of the body; the ears are large and erect; the tail much elongated. When pursued, it can burrow itself out of sight in a few minutes, working inward with great rapidity. Three species are known—one in South Africa, another in Senegal, a third in Southern Nubia. See Ant Eaters.



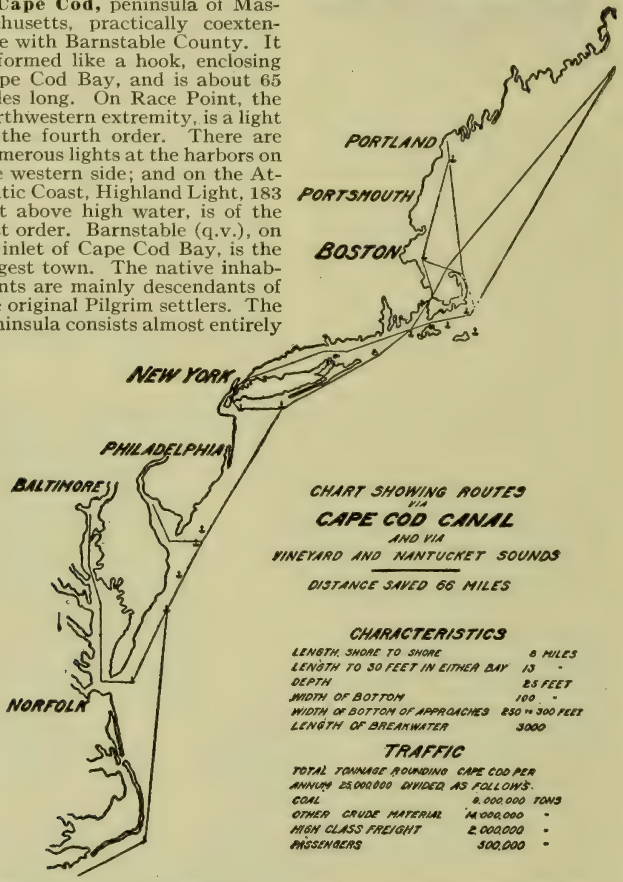
Cape Breton Island, brit'un *or* bret'un, rocky island of irregular form, Canada, at the eastern extremity of the province of Nova Scotia (q.v.), of which, politically, it forms a part, and from which it is separated by the Strait of Canso; area, 3,120 square miles. The surface is broken by several ranges of low hills, rising to an elevated plateau (1,200 feet) in the north. Triangular in form, the island is deeply indented by bays and harbors. An arm of the sea, the *Bras d'Or* ('Arm of Gold'), enters from the east coast, enlarging into Bras d'Or Lake (q.v.), and penetrates to within a mile of St. Peter's Bay, with which it is connected by St. Peter's Canal. The beautiful scenery around the shores of this lake and the salubrity of the climate have made Cape Breton Island a favorite tourist resort. There are deposits of coal, iron ore, marble, and gypsum. The principal exports are timber, fish, iron ore, and coal. The capital is Sydney, which has iron and steel works, and steamship connection with Port Aux Basques, Newfoundland.

Cape Breton Island was assigned to France by the Peace of St. Germain (1654). After the loss of Acadia (1713), the town and harbor of Louisburg (q.v.) were elaborately fortified and became the headquarters of the French operations against the English colonies. The fortress was captured by the British in 1758, and its possession was confirmed by the Treaty of Paris (1763). At first a part of Nova Scotia, it was erected into a separate colony, but in 1819 was again annexed to Nova Scotia. Pop. (1921) 97,200, mainly of Scottish Highland descent.

Cape Buffalo. See BUFFALO.

Cape Coast Castle, town, West Africa, in the British colony of Gold Coast, formerly its capital; situated on the coast in about 1° 10′ w.; 315 miles west of Lagos. It is of some commercial importance and has a trade in ivory, gold and palm oil. It was first settled by the Portuguese in 1610 and in 1652 the Swedes built a castle there. The Dutch captured it in 1659 and in 1664 it was taken by the British who have held it since that date. Pop. (1921) 15,000.

Cape Cod, peninsula of Massachusetts, practically coextensive with Barnstable County. It is formed like a hook, enclosing Cape Cod Bay, and is about 65 miles long. On Race Point, the northwestern extremity, is a light of the fourth order. There are numerous lights at the harbors on the western side; and on the Atlantic Coast, Highland Light, 183 feet above high water, is of the first order. Barnstable (q.v.), on an inlet of Cape Cod Bay, is the largest town. The native inhabitants are mainly descendants of the original Pilgrim settlers. The peninsula consists almost entirely of sand, but is favorable to cranberry culture, which is extensively carried on. The fisheries afford the chief occupation, and the men are excellent sailors.


PORTLAND
PORTSMOUTH
BOSTON
NEW YORK
PHILADELPHIA
BALTIMORE
NORFOLK
CHART SHOWING ROUTES
VIA
CAPE COD CANAL
AND VIA
VINEYARD AND NANTUCKET SOUNDS
DISTANCE SAVED 66 MILES
CHARACTERISTICS
LENGTH, SHORE TO SHORE 8 MILES
LENGTH TO 30 FEET IN EITHER BAY 13 "
DEPTH 25 FEET
WIDTH OF BOTTOM 100 "
WIDTH OF BOTTOM OF APPROACHES 250 TO 300 FEET
LENGTH OF BREAKWATER 3000
TRAFFIC
TOTAL TONNAGE ROUNDING CAPE COD PER ANNUM 25.000.000 DIVIDED AS FOLLOWS.
COAL 8.000.000 TONS
OTHER CRUDE MATERIAL 14.000.000 "
HIGH CLASS FREIGHT 2.000.000 "
PASSENGERS 500.000 "

In 1909–14 a canal across Cape Cod, from Barnstable Bay to Buzzards Bay was constructed, which enables vessels to avoid the dangerous trip around the Cape. See CAPE COD CANAL.

Cape Cod Canal, a canal connecting Buzzards and Barnstable Bays, off the coast of Massachusetts. Soon after their arrival at Plymouth in 1620, the Pilgrims recognized the need of a direct waterway connecting Barnstable and Buzzards Bay. As early as 1627 they had established a trading post on the shore of Buzzards Bay (at the present entrance to the canal), which was one point in the direct trade route between the Plymouth colony and the Dutch colony at Manhattan Island. This route Governor Bradford, in his diary, described in part as follows:

'For our greater convenience of trade, to discharge our engagements, and maintain ourselves, we have built a small pinnace at Manomet, a place on the sea twenty miles to the south, to which by another creek on this side [Scusset] we transport our goods by water to within four or five miles, and thence carry them overland to the vessel, thereby avoiding the compassing of Cape Cod with those dangerous shoals, and make our voyage southward with far less time and hazard.'

During the remaining years of the seventeenth century, plans to connect the Scusset River and the Herring River by means of a narrow canal about three miles in length were seriously considered. In 1697 a resolution was passed by the General Court of Massachusetts, providing for the appointment of a committee of three persons 'to view a place for a passage' between the two bays, but there appears to have been no official report by this committee. In 1776 the General Court passed a resolve providing for the appointment of a committee 'to repair to the town of Sandwich and to view the premises and report whether the cutting of a canal . . . be practical or not, and authorizing the committee 'to employ any necessary surveyors or assistants for that purpose.' The survey was begun, but the military events of 1776 rendered it advisable to discontinue the work. In 1791, and at more or less irregular intervals thereafter, the matter was considered by the State legislature. In 1880 a charter was granted to a construction company, and the work was actually begun, but owing to lack of funds the project was abandoned and the charter was surrendered.

On June 1, 1899, the legislature granted a charter incorporating the Boston, Cape Cod, and New York Canal Company, under which the company began in 1909 to construct the present canal. It was formally opened for partial operation on July 29, 1914, the event being marked by a holiday celebration and appropriate exercises, and it has since been completed. Certain engineering facts are as follows: Length of canal proper, 8 miles; total length to 30 foot depth in both bays, 13 miles; minimum depth at low water, 25 feet; minimum bottom width, 100 feet; bottom width of approaches, 250 to 300 feet; deepest cut (below tide water), 29 feet; estimated amount of material excavated, 17,000,000 cubic yards.

As the canal at each end, and for a considerable portion of its route, follows the natural course of small streams which formerly floated boats of light draft, the actual work of excavation, principally through sand, was not difficult from an engineering point of view. No locks were found necessary because the flow of the tide and the tidal differences between the two ends of the canal were not sufficient to require them. Three bridges spanning the canal were required. One of these, a railroad bridge of the Strauss-Bascule type, having a span of 160 feet, was erected at the Buzzards Bay entrance, and two highway bridges—one at Bourne and the other at Sagamore—have also been constructed. The canal is lighted by electricity, the lights being on poles placed opposite each other 500 feet apart on either side of the canal, and other necessary aids to navigation have been provided.

In order to prevent the accumulation of sand at the mouth of the canal where it opens into Barnstable Bay, a granite breakwater, 3,000 feet in length, was built to the northward of the channel. It was also found necessary to riprap with granite the banks of the canal for portions of its length in order to prevent erosion of the sand.

The depth and width of this canal compare favorably with corresponding dimensions of the great ship canals of the world, and permit of the passage not only of vessels engaged in coastwise freight and passenger traffic, but also of the smaller vessels of the navy, including even naval cruisers—for which, in the event of naval engagements, an inside water route might prove of great strategic importance. This latter consideration led to the proposal that the canal be purchased and operated by the Federal Government as a measure of defence and bills to that end were introduced into Congress with the result that in March, 1928, the canal was purchased by the U. S. Government for the sum of $5,500,000.

The distance between Boston and New York City by way of Vineyard Sound is 334 statute miles, and by way of the canal 264 statute miles, the latter route being shorter by 70 statute miles, and making possible a saving of about four hours in time of transit. The possible saving in life and property by the use of the canal route may be indicated by the fact that in 1843–1903 over 700 lives, and property averaging at least a half-million dollars a year, were lost in wrecks occurring between Gay Head and Provincetown.

The Cape Cod Construction Company (August Belmont, president, and William Barclay Parsons, chief engineer) was formed to do the actual construction work, and this company contracted to dig the canal and build the necessary wharves, breakwaters, etc., for the sum of $11,990,000, payable $6,000,000 in first mortgage, 5 per cent. gold bonds, and the remainder in stock of the company. The actual cost of construction was approximately $13,500,000.

Consult W. B. Parsons' *The Cape Cod Canal* (*Annals* of the American Academy of Political and Social Science, January, 1908); *Reports* of the Massachusetts Board of Harbor and Land Commissioners (1907–15); *Opening of the Cape Cod Canal* (*Scientific American*, Aug. 15, 1914); *Cape Cod Canal—Interesting Facts for Navigators* (issued April 20, 1915); Moody's *Manual of Railroads and Corporation Securities* (vol. ii., 1916).

Cape Colony. See Cape of Good Hope.

Cape Fear River, river, North Carolina, rising in the northern part of that State, flowing southeast, and emptying into the Atlantic Ocean after a course of about 300 miles. It is navigable for 150 miles, to Fayetteville. Rice fields are a feature along its lower course.

Capefigue, kȧp-fēg′, Jean Baptiste Honoré Raymond (1802–72), French historian, was born in Marseilles. In 1821 he went from Aix to Paris to complete his juridical course, but after 1831 devoted himself to literature. His works, which are still read for their picturesque and piquant style, comprise nearly one hundred volumes, and include *Histoire de Philippe Auguste* (1829); *Histoire de la restauration* (1831–3); *Richelieu, Mazarin, et la Fronde* (1835–6); *Philippe d'Orléans* (1838); *La ligue* (1843).

Cape Girardeau, jē-rär-dō′, city, Missouri, in Cape Girardeau County, on the Mississippi River, and on the St. Louis-San Francisco Railroad; 98 miles southeast of St. Louis. It is the seat of St. Vincent's College (Roman Catholic), Convent of the Sisters of Loretto, and a State normal school. There is a large river and railroad trade. Manufactures include lime, bricks, flour, lumber, tobacco, malt, Portland cement and mineral paint. Pop. (1910) 8,475; (1920) 14,258.

Cape Haitien, hä′tē-en, or Le Cap, city and seaport, Haiti, situated on a commodious harbor on the north coast; 85 miles north of Port au Prince. It is connected by cable with France, Santo Domingo, and South America. Exports include coffee, cacao, logwood, and honey. Under the rule of the French it was the capital of the colony. The city was the scene of a terrible earthquake in 1842, and suffered from bombardment by the British in 1865. Pop. 20,000.

Cape Horn. See Horn, Cape.

Cape Hunting Dog, a dog belonging to the family Canidæ, found in many parts of Africa. It is somewhat like a mastiff, but is brightly colored, and irregularly spotted with white or yellow outlined in black. It resembles the hyena in having only four toes on each foot, but is dog-like in habit, and hunts in packs, which sometimes ravage the sheep farms of South Africa.

Cape Jasmine. See Jasmine.

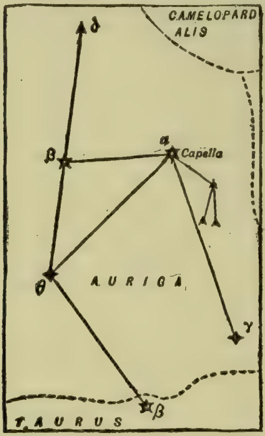
Capel, kap′el, Thomas John (1836–1911), English Roman Catholic clergyman and educator. He was one of the founders and vice-principal of St. Mary's Normal College, London, and rector of the Roman Catholic University of Kensington (1874–8). In 1883 he went to the United States on a lecturing tour, and later settled in San Francisco, Cal. He had a fine presence, a ringing voice, and a winning personality, and is delineated in Disraeli's *Lothair* under the character of Catesby. His writings include *Great Britain and Rome* (1881): *The Pope the Head of the Church* (1885).

Capelin, kap′*e*-lin, or Caplin (*Mallotus villosus*), a small fish, six to eight inches long, resembling a smelt. It occurs in great shoals in all northern seas, and is found as far south as Cape Cod on the east. It deposits its eggs along the Arctic Coast, and is useful both as a food fish and a bait for cod.

Capell, kā′pel, Edward (1713-81), Shakespearean commentator, was born in Throston, near Bury St. Edmunds. Appointed deputy inspector of plays in 1737, he devoted himself to the study of Shakespeare, transcribing his works, it is stated, ten times. In 1768 an edition of Shakespeare in ten volumes appeared which cost Capell twenty years' labor. The first part of the commentary was issued in 1774, and in 1783, two years after his decease, the complete work was published. As a textual critic, Capell was singularly acute.

Capella, k*a*-pel′*a*(= α Aurigæ), one of the three brightest stars in the Northern Hemisphere (photometric magnitude 0.21). In 1899 it was discovered simultaneously by Campbell of Lick Observatory and Newall of Cambridge Observatory to be a spectroscopic binary (see Spectroscopic Binaries), composed of two sun-like bodies, revolving in a period of 104 days. The fainter member of the pair gives light of a somewhat less 'advanced' spectral type than the primary. Its actual light power must centuple that of the sun. Its parallax of 0″.09 corresponds to a distance of 36 light years, and it is receding from the sun at the rate of 15 miles a second.

Capella, Martianus Mineus Felix, learned author who flourished about the fifth century, was born in North Africa. The work which has preserved his name to posterity is the *Satyricon*, an encyclopædic compilation drawing its material mostly from Pliny and Varro, highly esteemed during the Middle Ages as a work of reference. It consists of nine books, a curious medley of prose and poetry, full of all sorts of data but of no literary value.



Capella, or α Aurigæ

Capello, kä-pel'lō (Cappello), Bianco (*c.* 1542–87), Tuscan grand duchess, was born in Venice, of a noble family, and eloped with a banker's clerk, Pitro Buonaventuri, who took refuge with Francesco de' Medici, son of the grand duke of Tuscany, at Florence. Francesco, himself married to an archduchess of Austria, was attracted by Bianca's beauty, and, succeeding to the grand-ducal throne on the death of his father, caused the death of Buonaventuri in 1570. Six years later Bianca pretended to give birth to a son, the child being obtained clandestinely; and on the death of the grand duchess, Francesco was persuaded to marry Bianca (1579). After the death of Francesco's son by his first duchess, Bianca manœuvred to gain the good will of her enemy, Cardinal Fernando de' Medici, Francesco's brother and probable heir; but it has been surmised that the Cardinal poisoned them, as both Francesco and Bianca died a few days after meeting him at Poggio à Cajano. Several tragedies have been written, based on her career.

Cape May City, summer resort, New Jersey, in Cape May County, on the Pennsylvania and the Reading Railroads; 40 miles southwest of Atlantic City, and 82 miles by rail south of Philadelphia. It has a fine beach 5 miles long, a boardwalk, convention hall, recreation piers, and splendid bathing facilities. There are fishing and canning industries. Two miles west is the point from which the city takes its name, Cape May, the southern extremity of New Jersey (see May, Cape). It was the first city in New Jersey to adopt the city manager form of government. Pop. (1910) 2,471; (1920) 2,999.

Capen, Edward Warren (1870–), American sociologist, was born in Jamaica Plain, Mass. He was graduated from Amherst College (1894), Hartford Theological Seminary (1898), and Columbia University (ph.d., 1904). From 1904 to 1907 he was engaged in historical researches for the American Board of Commissioners for Foreign Missions, and from 1907 to 1909 in special sociological and missionary research in the Far East. He was instructor (1911–14), associate professor (1914–17), and dean (since 1919), of sociology at the Kennedy School of Missions, and since 1917 has been professor of sociology at the Hartford Seminary Foundation. In 1912 he was ordained in the Congregational ministry. His published works include *Historical Development of the Poor Law of Connecticut; Sociological Progress in Mission Lands* (1913) and many articles and pamphlets.

Capen, kā'pen, Elmer Hewitt (1838–1905), American educator, was born in Stoughton, Mass. He was graduated from Tufts College (1860), studied law, but later entered the Universalist ministry (1865), and was pastor of churches in Gloucester, Mass., St. Paul, Minn., and Providence, R. I., until his appointment as president of Tufts College in 1875. He also gave instruction in ethics and political economy.

Cape of Good Hope, popularly regarded as the most southerly promontory of Africa, though it is half a degree to the north of Cape Agulhas, which forms the turning point from south to east on the voyage from Europe to India. It was discovered in 1486 by Dias, a Portuguese navigator but its importance was not realized until in 1497 Vasco da Gama rounded it on his voyage from Lisbon to Calicut.

Cape of Good Hope, formerly Cape Colony, province of the Union of South Africa, situated at the southern extremity of the African continent, and bounded by the Orange River, Bechuanaland Protectorate, Orange Free State, Basutoland, and Natal on the north; by the Indian Ocean on the east and south; and by the Atlantic Ocean on the west. It comprises the colony proper, East Griqualand, Tembuland, Transkei, Walfish Bay, Pondoland, and Bechuanaland (qq.v.). Area, 276,995 square miles.

Topography and Climate.—Broadly speaking, the Cape of Good Hope may be described as a series of terraces rising like steps from a narrow coastal plain and merging in the great South African tableland, only a small portion of which lies within the province. The principal mountain chain, which forms the southern rampart of this tableland, follows the coast line of the cape at a distance from it of about 150 miles, attaining an average elevation of 6,000 to 8,000 feet, and culminating in Compass Berg, 8,500 feet above the sea. As it traverses the province in a southwest, west, and northwest direction, this chain is known successively as the Drakenberg or Quathlamba Range, the Stormberg, the Sneeuberg, the Nieuveld and Roggeveld Mountains, and the Kamiesberg. Separated from it by an arid plateau, known as the Great Karroo (see Karroo), is a central chain of mountains including the Cedarberg, Zwarteberg, Groote River, Zuurberg, and other ranges. Still farther south another chain, rising from the lowland which borders the sea, follows a parallel course.

The coast line is unbroken by gulfs and inlets, and there are practically no navigable rivers, such streams as there are being subject to violent floods and long periods of drought broken by sudden and torrential thunderstorms.

Generally speaking, the climate is healthful, though the alternations of heat and cold have a wide daily range. It is warm, moist, and equable on the coast; colder and drier in winter and hotter in summer in the midlands; and still drier and more bracing in the northern highlands. The average maximum temperature in January, the hottest month, varies from 92° f. at Kimberley to 76° f. at Port Elizabeth; the average minimum for July, the coldest month, from 29° f. at Aliwal North to 49° f. at Port Elizabeth. The annual rainfall ranges from a few inches in the northwest and on the Great Karroo, to 20 to 34 inches in the neighborhood of Cape Town.

Flora and Fauna.—The flora of the Cape of Good Hope is rich and varied near the coast, growing sparser toward the interior. Beautiful heaths in great variety are found about Cape Town, numerous subtropical plants occur on the eastern coastlands, and small thorny mimosas or acacias, other shrubs, and bulbous plants clothe the Karroos after the spring rains. Forests are few, being confined to an area of 550 square miles on the southern slopes of the coastal hills. The principal timber trees are the tall yellow woods (*Podocarpus*), the valuable stinkwood or laurelwood (*Ocotea bullata*), the sneezewood (*Ptæroxylon utile*), and the black ironwood (*Olea laurifolia*).

The wild animals of the South African veldt have been nearly all destroyed. A few elephants and buffalo are preserved in the Knysna Forest; there are some bontebok near Cape Agulhas, a few boschbok in the eastern districts, and large herds of springbok. Among other animals are the steenbok, leopard, cheetah, hyena, jackal, aard wolf, Cape wild dog, ant bear, and scaly ant eater. Reptiles include the crocodile, cobra di capello, and puff adder. Birds are numerous, the ostrich being of considerable economic importance.

Mining.—The province is rich in mineral resources. The most productive diamond mines in the world are located at Kimberley (q. v.), and diamonds are also obtained from alluvial diggings along the banks of the Vaal. Copper is found throughout the district of Namaqualand, and there are extensive coal deposits in the Stormberg. Iron and lead ores, gold, manganese, tin, and asbestos are also found. In 1914 the diamond output amounted to 1,350,536 carats, valued at $17,720,360; 14,369 tons of copper were shipped; and 53,621 tons of coal were mined.

Agriculture and Stock Raising.—Of the three chief industries of the Cape—mining, agriculture, and stock raising—agriculture is by far the least important, the inadequate water supply, long droughts, and sudden and severe storms combining to render crops extremely uncertain. The principal products are wheat, barley, oats, mealies or Indian corn, potatoes and other European vegetables, tobacco, and a wide variety of fruits, including, besides the indigenous 'Cape gooseberry,' apples, pears, figs, apricots, peaches, oranges, limes, pomegranates, quinces, bananas, walnuts, and almonds. There are large vineyards in the western part of the province, and wine, brandy, and raisins are produced.

Stock farming is carried on much more extensively than agriculture, practically all the land, with the exception of the rough mountain districts and the most arid deserts, being suitable for pasturage. Sheep, cattle, Angora and other goats, horses, and ostriches are raised, wool, mohair, and ostrich feathers constituting important products. At the beginning of 1914 sheep numbered 18,594,746, and goats 7,732,912.

Manufactures have not as yet been extensively developed. The timber of the colony is suited for wagon making and for articles of furniture; and these trades have been carried on. A beginning has been made in the manufacture of woollen fabrics, and leather has been manufactured. Other industries include harness and saddle factories, flour mills, foundries, and breweries.

Railways.—At the beginning of 1915 there were 8,982 miles of railway in the province, of which 8,486 were owned and controlled by the Federal Government. The principal lines are that from Cape Town north to the Belgian Congo (see Cape to Cairo Railway); that from Port Elizabeth to the Orange River, which joins the lines of the Orange Free State and the Transvaal; and that from East London to the Orange Free State. There are also numerous branch lines and shorter independent roads. Steamship and cable communication with Europe, Asia, and Australia exists.

Commerce.—The greater part of the foreign trade is with the United Kingdom. In 1915 this was estimated at $35,950,995 in exports, exclusive of diamonds, and $44,502,505 in imports. The leading exports to that country and their value in 1914 were: diamonds, $27,354,495; wool, $15,743,910; feathers, $6,160,805; skins and furs, $4,702,295; mohair, $4,133,285; copper, $1,817,395; raw hides, $1,669,655; maize, $678,745. The chief imports were cotton goods, woollens, clothing, machinery, iron and steel goods, boots and shoes, and carriages.

Population and Language.—The population in 1904 was 2,409,809; in 1911 it was 2,564,965, of whom 582,377 were whites, 7,690 Asiatics, 1,519,939 Bantus, and 454,959 mixed and other colored races. The chief cities are Cape Town, Kimberley, Port Elizabeth, and East London.

The native population may be divided into the Bushmen, the earliest aboriginal race, now almost extinct; the Hottentots, chiefly in the western provinces; and the great Bantu race, living in the east and northeast of the colony, and known as Kaffirs (see Bushmen; Hottentot; Kaffirs). In addition, there are Malay, Indian, and Chinese immigrants, and descendants of Buginese imported originally as slaves by the old Dutch East India government.

English is the language spoken officially throughout South Africa, and is the language of commerce, but Dutch, or rather the peculiar South African variety of Dutch known as the Africander Taal (see Taal), is used by many people.

Education and Religion.—The educational system of the Cape includes all classes, European and native, and admits of a gradual progress from the third class undenominational school through second and first class schools and college. There are also special industrial schools and poor schools for European children, state aided mission schools for the natives, aborigines' schools for the children of the native territories, and training and evening schools for both Europeans and natives. Education is compulsory for European children in by far the greater part of the province. In 1915 government aided schools numbered 4,593, with an enrollment of 103,909 European and 135,104 non-European pupils. Institutions of higher learning include the South African, Victoria, Rhodes University, and Huguenot Colleges, and a number of denominational schools.

Government.—Since 1872 the Cape of Good Hope has been under a responsible government, and since 1910 it has been a province of the South African Union, being represented in the Union Parliament by 8 members in the Senate and 51 in the House of Assembly. It is presided over by an administrator, appointed for five years by the Governor-General of the Union, and an executive committee of four elected by the provincial council.

History.—The Cape of Good Hope was first rounded by the Portuguese voyager and discoverer, Bartholomeu Diaz (q. v.), in 1486, and for a century and a half was used occasionally by Portuguese, English, and Dutch mariners engaged in the Eastern trade. In 1652 the Dutch East India Company took possession, and initiated a period of monopolistic and repressive control that lasted until the end of the eighteenth century. British forces occupied the colony in 1795 and again in 1806, and in 1814 it was ceded in perpetuity to the British crown. At that time the area was only about 120,000 square miles, and the population a little over 60,000. In 1820 the Eastern Province was founded by British colonists known as the 'Albany settlers.'

In 1834 the emancipation of the slaves in Cape Colony provoked wide discontent among the Dutch farmers (Boers), and from 1836 to 1840 great numbers of them migrated, or *trekked,* beyond the Orange River and into what is now the province of Natal (q. v.). Meanwhile, the northward advance of the British and the continual raids on the colonists' cattle made by the Kaffirs resulted in what is known as the Kaffir wars, nine in number. The first took place in 1811; the second in 1819, when the colony was extended to the River Keiskamma;

the third in 1834, when the boundary was advanced to the River Kei; the fifth in 1850–3, resulting in the formation of British Kaffraria as a crown colony and a native reserve for the Kaffirs, later incorporated with Cape Colony (1865); the ninth and last in 1877, resulting in the annexation of the Transkei.

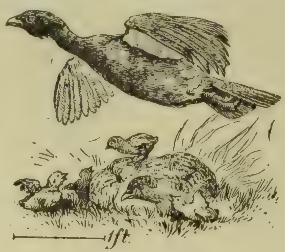
A new impetus to development was given by the discovery of diamonds in the districts north of the Orange River in 1867, and of the four richest diamond mines in the world in 1870 (Dutoitspan and Bultfontein) and 1871 (Kimberley and De Beers), resulting in the annexation of the Diamond Fields. In 1869 took place the incorporation of Basutoland; in 1874, of East Griqualand; in 1876, of Fingoland and No Man's Land; in 1877, of West Griqualand; in 1885, of Tembuland, Galekaland, and Bomvanaland. Pondoland was annexed in 1894, and British Bechuanaland in 1895; while toward the west, Walfish Bay, in Great Namaqualand, became part of the colony in 1884. In 1881 took place the first Boer war; one of its principal results was the formation of the Africander Bond (q. v.).

Among more recent events which have greatly influenced the political life of Cape Colony have been the Jameson Raid of 1895, and the Boer War of 1899–1902 (see South African War). Cecil Rhodes played an important part in the history of the colony, and was prime minister in 1890–6. In 1903 the Cape Parliament accepted the African Customs Convention, with a view of forming a South African Customs Union, which was joined by Natal, Orange River Colony, and Bechuanaland Protectorate. In June, 1909, the Colony adopted the constitution framed for the South African Union, and May 31, 1910, became a province of that commonwealth. See South African Union.

Bibliography.—Consult Theal's *Records of Cape Colony* (23 vols.); Brand's *Union of South Africa* (1909); S. Playne's *Cape Colony* (1912); *Statistical Year Book of the Union of South Africa* (annual).

Cape Pigeon, or Cape Petrel, sailors' names for a big petrel (*Daption capensis*), numerous about the Cape of Good Hope, and thence southward to the Atlantic islands.

Capercailzie, kap-*e*r-kāl′yi, *or* -zĭ, *or* kā-per-, Capercaillie, Wood Grouse, or Cock of the Woods (*Tetrao urogallus*), a large game bird, widely distributed throughout Europe in the hilly pine forests, for which it is naturally adapted, but especially plentiful in Sweden. The general color of the adult male is brownish black, minutely freckled with grayish white and with lighter brown; the quill feathers dark brown; the tail feathers nearly black, some of the longer tail coverts on the sides of the tail tipped with white; the chest of a shining dark green. The general color of the female and of young males is dark brown, freckled with yellowish brown. The feet are feathered to the toes, but these are naked. It feeds on berries, seeds, worms, insects, etc., and on the young shoots of the pine. The female makes her nest on the ground, and lays from six to twelve eggs, of a pale reddish or yellowish brown, spotted with other shades of brown. Like the blackcock, the capercailzie is polygamous. In spring the males indulge in untiring love song, and in grotesque play to attract the females. Fights between rival males are of common occurrence.


Capercailzie.

Cape River. See Segovia River.

Capern, kā′pern, Edward (1819–94), English poet, born at Tiverton, Devonshire. Under the pseudonym of 'the Rural Postman of Bideford,' he published *Poems* (1856), *Ballads and Songs* (1858), *Devonshire Melodist,* with music (1862), *Wayside Warbles* (1865), *Sun Gleams and Shadow Pearls* (1881), which obtained some appreciative recognition from Landor, Dickens, Kingsley, and Tennyson.

Capernaum, k*a*-pûr′nā-um, meaning 'the village of Nahum,' was in the time of Christ a prosperous place, is called 'his own city' (Matt. ix. 1), and was one of the three which he upbraided 'because they repented not.' The site generally accepted from the fourth century is Tell Hum, on the northwest coast of the Sea of Galilee. Condor believes that this place has no claim to be regarded as the real site of Capernaum, and prefers Khan Minieh, beside the spring Et Tineh, in the northeast corner of the plain of Gennesaret.

Ca′pers are the pickled flower buds of the caper bush (*Capparis spinosa*). They have an agreeable pungency of taste, with a slight bitterness, and have long been in use as a condiment and ingredient of sauces. They are of a grayish-green color, to improve which copper is sometimes used; this, however, as in the case of other pickles, renders them poisonous.

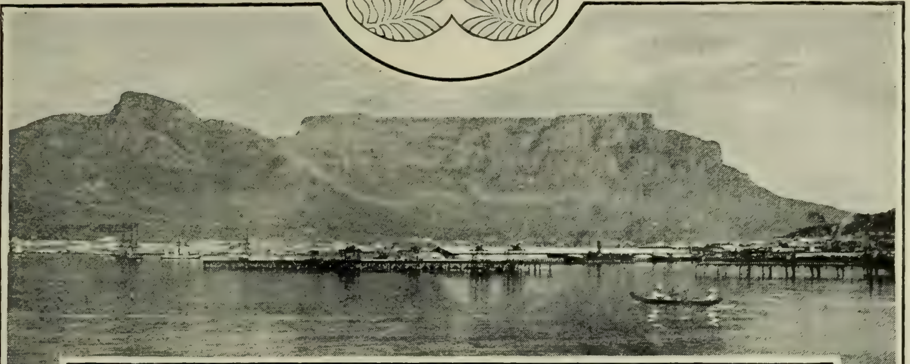
The *caper bush* is a native of the Mediterranean countries, and is cultivated in some parts of the south of France and in Italy, but most of all in Sicily. It is a trailing, rambling shrub, loving dry places, and often growing on rocks or walls. It begins to flower early in summer, and continues flowering till winter. The buds are gathered every morning, and are immediately put into vinegar and salt.

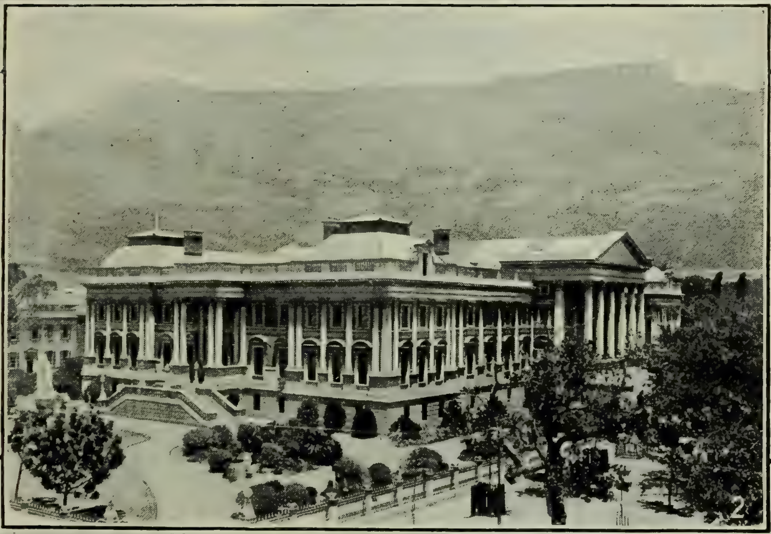
Ca′pet, the family name of the third Frankish dynasty, which ruled France in the direct line from 989 to 1328, and through the collateral branches of Valois and Bourbon till the French Revolution (1789). The founder of the house was Hugh Capet (see Capet, Hugh). For an account of the Capetian dynasty, see France, *History.*

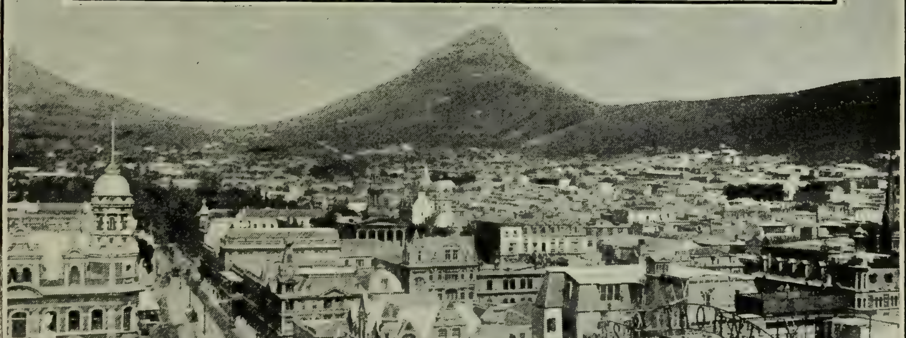
Capet, Hugh (*c.* 938–996), king of France, son of Hugh the Great, duke of Francia and count of Paris. The origin of the Capetian house is obscure. It may probably be traced to a Teutonic stock. The Capetians had for long identified themselves with the Western or French portion of the Caroling empire, in particular with Paris and the Ile de France. The defence of Paris against the Northmen in the famous siege of 885 had been the work of Odo, great-grandfather of Hugh. Hence in the break-up of the Caroling empire it was natural that the Western Franks should look to the Capetians for leadership. In his early years Duke Hugh was a kind of mayor of the palace to the Caroling kings; but in 987, on the death of the Caroling Lothair, he was elected king.

Hugh's reign was not remarkable. He married Roxale, widow of the Count of Flanders, and held the emperor and the Church at arm's length; but he was obliged to pay for the support of his feudal neighbors by large gifts of royal domain. He laid, however, the foundations of a dynasty which endured uninterruptedly for more than 800 years.

Cape to Cairo Railway, a project, originally conceived by Cecil J. Rhodes (q. v.), for a great African trunk line running from Cape Town, at the southern extremity of the continent, to Cairo







CAPE TOWN.

1. Cape Town from the sea, showing Table Mountain and Devil's Peak. 2. The Houses of Parliament. 3. Cape Town, looking to Lion's Head, from the Tower of the Post Office.

at the north. The direct distance between the two termini is about 5,700 miles, and over 2,000 miles of lake and river way available for traffic lie between, reducing the distance to be covered by rail to something like 4,000 miles. As originally planned, the railway was to follow an all British route, but the awarding of the region between Uganda and British East Africa to Germany in 1889 made it necessary for the line, after leaving Rhodesia, to pass through either Belgian or German territory before entering the British possessions farther north.

In 1867 the only railway line in South Africa ran between Cape Town and Wellington, a distance of 40 miles. Kimberley was reached in 1885; the section from Kimberley to Vryburg was opened in December, 1890; and that from Vryburg to Buluwayo in 1897. At this point the Rhodesian Company began construction shortly before the outbreak of the Boer War in 1899.

By 1904 the road had progressed to Victoria Falls, where it crosses the Zambezi River by the highest bridge in the world, a steel cantilever structure, 650 feet long and 380 feet above flood water. By 1906 it had reached Rhodesia Broken Hill Mine, and in November, 1909, it had been carried to Bwana Mkubwa, on the southern border of the Belgian Congo. From that point it extends through the great copper districts of Katanga, passing from Elizabethville to Kambove, and thence to the Biano plateau, on its way to Bukama, from which it was about 100 miles distant in 1916. At that time the total length of line from Cape Town was 2,500 miles.

In the north, the first link in the Cape to Cairo system is the Nile trunk of the Egyptian State railways, which runs from Cairo to Shellal, just above Assuan and the First Cataract. From here a two-days' steamer journey connects with the main line of the Sudan Government Railway from Wadi Halfa to Khartum, completed in 1899. The line was extended to Sennar on the Blue Nile in 1910, and from that point has been carried due west to Kosti, on the White Nile, 238 miles from Khartum. The railway construction programme of the Sudan calls for the extension of the road as rapidly as possible to Gondokoro, just over the Uganda border, whence Uganda will probably carry it to Lake Albert, with a branch to the outlet of Victoria Nyanza. From Lake Albert any of several routes may be taken. The one which seems most likely of early completion will run southwest to Stanleyville in the Belgian Congo, thence by a line already completed to Ponthierville, then 196 miles by steamer to Kindu, whence there is a line in operation to Congolo. From Congolo connection may be made with Bukama by steamer. A more easterly route by way of Victoria Nyanza to the southern extremity of Lake Tanganyika, and thence to Elizabethville, will probably ultimately be used.

Subsidiary side lines will join the main line at various points to form a complete continental system. Of these the most important yet built are that to the Red Sea Coast and that through Portuguese East Africa to Beira. Another line in course of construction will run from Elizabethville to Benguella on the west coast, 1,000 miles distant.

Cape Town, capital of Cape of Good Hope province, and metropolis of South Africa, is beautifully situated at the base of Table Mountain, and on the shores of Table Bay. The view of the town from the bay, with the steep and massive mountain close behind it, is most imposing. Another imposing prospect is that which opens up to the traveller who ascends behind the town, and gazes over it on Table Bay, with Cape Town at its feet. The town lies to the north of the Cape peninsula, which stretches due south for 18 miles to Cape Point lighthouse. On the south side of the neck of the peninsula lies the large curve of False Bay, with its minor anchorages of Simon's Bay and Kalk Bay, the latter used especially by Malay fishermen. The harbor entrance is defended by a castle. Mean annual temperature, 63° F.; annual rainfall, about 25 inches.

Table Bay is a poor natural harbor, exposed to the north and northwest gales of winter; but at an expenditure of $25,000,000 a good harbor and dock have been constructed. Shipping in the bay is sheltered by a breakwater (3,640 feet long), and there are wet docks, a dry dock, and a government patent slip. An outer harbor, with minimum depth of 27 feet, is under construction. The city is the terminus of the Cape to Cairo Railway (q. v.).

Cape Town was laid out by its Dutch founders with mathematical preciseness—the main thoroughfares crossing one another at right angles. The beautiful government gardens in the heart of the town serve the purposes of a public park. The town is the see of an Anglican and a Roman Catholic bishop; has fine government buildings, especially the Parliament House, and municipal buildings; the English cathedral, South African College, South African Museum and Library, Grey Library, and Botanic Gardens. The University of the Cape of Good Hope (1873) is an examining body, with affiliated colleges. The Observatory (1820) is the finest in the Southern Hemisphere. The environs are charming. One one side are the seaside suburbs of Sea Point and Green Point; on the other, through shady woods, a succession of populous suburban districts, connected by steam and electric railways, such as Woodstock, Maitland, Mowbray, Rosebank, Rodebosch (noted for its college), Newlands, Claremont, and Wynberg. Cape Town is the seat of the legislature of the Union of South Africa, of the provincial government, and of the provincial division of the Supreme Court. It was founded by the Dutch in 1652. Pop. (1915) 69,000, of whom 30,000 were white; pop. with suburbs, 160,000.

Cape Verde Islands, vûrd, a group of islands belonging to Portugal, in the Atlantic Ocean, lying about 350 miles west of Cape Verde on the west coast of Africa, between lat. 17° 13′ and 14° 47′ N. and long. 22° 40′ and 25° 22′ W. They include ten inhabited islands—Santo Antão, São Vicente, Santa Luzia, São Nicolão, Boa Vista, Sal, Maio, São Thiago (Santiago), Fogo, and Brava—and four uninhabited islets, with a total area of 1,480 square miles.

The islands, which are volcanic in origin, are separated from one another by deep passages, and are extremely mountainous, the loftiest point being a volcanic peak on the island of Fogo, 9,157 feet above the sea. There are several good harbors, notably that of Porto Grande on the island of São Vicente, which is important as a coaling station, and that of Praia on the island of São Thiago. Seen from the sea the islands present an arid and uninviting appearance; but the inland valleys, especially in years of abundant rainfall, are clothed with verdure. The climate is hot and unhealthful, the summer temperature ranging from 80° to 90° F. near the coast. The rainy season lasts from August to October, and during January and February the harmattan, a dry east wind from the continent, is felt. The flora is tropical.

Coffee is the chief crop, and the physic nut (*Jatropha curcas*), maize, millet, sugar cane, manioc, indigo, oranges, pumpkins, and sweet potatoes are raised. Aside from agriculture, the principal industries are cattle raising, the making of straw hats, lace, and, embroidery, the manufacture of sugar, spirits, salt, and cotton textiles, and fish curing. Commerce is chiefly with Portugal and the Portuguese possessions on the neighboring African coast. Exports include coffee, medicinal produce, millet, sugar, spirits, salt, hides, and fish.

The Cape Verde Islands are a Portuguese colony under a governor-general residing at Praia. The inhabitants are chiefly mulattoes and negroes, with some Portuguese. Pop. (1912) 143,929.

The islands were discovered by Cadamosto in 1457, and colonized by Prince Ferdinand, to whom they were granted by Alfonso v. of Portugal. They were later bestowed upon Prince Emanuel, and upon his succession to the throne (1495) became a part of the dominions of the crown.

Cape York Peninsula, North Queensland, Australia, separates the Gulf of Carpentaria from the Pacific Ocean. Its apex projects into Torres Strait and terminates in Cape York.

Capias, kā'pi-as ('thou mayest seize'), the short name of several writs directed to the sheriff requiring him to arrest the person named therein. They have been superseded for most purposes by the writ of attachment. See Attachment.

Cap'illaries. The name capillary (from *capillus*, 'a hair') is given to the minute vessels which form the connection between the terminal branches of the arteries and the commencements of the trunks of the veins. These vessels are of various sizes, some admitting only one blood corpuscle at once, while others are large enough to allow the simultaneous passage of two, three, or more corpuscles. In muscular tissue, they run for the most part parallel to one another; in other cases (as around fat cells) they have a spherical arrangement; and in the skin and in parts of the intestines they form loops. Their walls are of fine, nucleated epithelial cells, placed edge to edge. The blood moves at its slowest in the capillaries, and in the case of inflammation of any part the white blood corpuscles pass through their walls. See Circulation of the Blood.

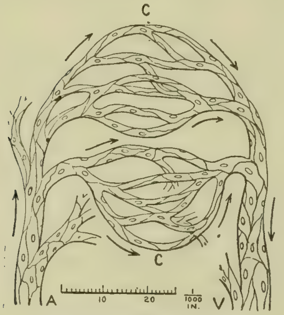
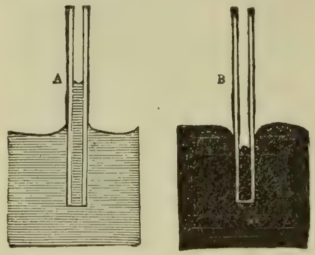


Diagram of Capillaries.
A, Artery; V, vein; C, capillaries.

Capillar'ity. When a number of clean glass tubes of very fine bore, each open at both ends, are immersed in water, the water rises in each to a higher level than at which it stands outside, and the finer the bore the greater is the height of the water. Phenomena of this kind are called *capillary phenomena*, since they are evident in narrow, hairlike tubes only. These phenomena seem to be in contradiction to hydrostatical principles, but the contradiction is only apparent.



Capillarity.
A, Glass tube in water; B, in mercury.

The explanation lies in the existence of tension in the surface layers of a liquid. Many facts make the existence of this tension evident, notably the spontaneous contraction of liquid films, such as soap films. Now, any film which tends to contract tends to become a plane if free to do so; and if kept curved, it presses toward the concave side. This explains the tendency of a drop of liquid to become spherical. The surface becomes as small as possible consistent with the condition of holding a given amount of liquid, and the sphere is the smallest surface enclosing a given volume.

Again, a liquid which rises in a capillary tube is observed to be always concave upward. Hence there is less pressure in the interior of the liquid immediately below the surface than there is above. That is to say, the pressure just below is less than the atmospheric pressure; and the atmospheric pressure is reached *inside the tube* only at some distance below the surface. But outside the tube, at the surface of the liquid, the pressure is atmospheric. Hence, by hydrostatic principles, the liquid must rise in the tube until the hydrostatic condition is satisfied.

The reason for the water climbing up the sides of a glass tube, so as to make the surface concave upward, lies in the greater attraction of water to glass than of water to water. If in any liquid the attraction of liquid for liquid exceeded that of liquid for solid, the surface would become concave downward, and the liquid would not rise so high inside as outside the tube. This occurs, for example, in the case of mercury in a glass tube. Consult C. V. Boys' *Soap Bubbles* (new ed. 1912); Tait's *Properties of Matter*.

Capistrano, kä-pēs-trä'nō, Giovanni di (1385–1456), Italian Franciscan preacher, born at Capistrano in the Abruzzi, and entered the Franciscan Order in 1416. He preached against the Fratricelli and other heretical orders in Italy, and with Bernhardin of Siena helped to reform his order. He was twice vicar-general, and his eloquence won back to the church many Hussites of Moravia, to which country he was sent as papal legate in 1451. After the capture of Constantinople (1453) he preached a crusade against the Turks, who then threatened to overrun Western Europe. In 1456 he conducted 40,000 Christians to Belgrade, to the assistance of John Hunyady (q. v.), and greatly contributed to deliver that town from the Turks. He was canonized in 1724. His chief work is a treatise on the *Authority of Pope and Council*.

Capital, in architecture. See Column.

Capital, in economics, has been defined as that portion of a man's wealth from which he derives, or expects to derive, an income. Some economists employ the term with an attempt at greater precision, limiting the term to the instruments and materials of production which are themselves the result of industry. Land and other natural resources are thus excluded from capital. It is generally agreed that the conception of capital involves an element, as it has been called, of *prospectiveness*, and also an element of *productivity*. Different writers have laid special stress on the one or the other of these characteristics. A regard for the future rather than the immediate present obviously leads to the accumulation and employment of capital; an increase of wealth is no less manifestly the result of such action.

Capital has sometimes been classified as *fixed* and *circulating*. Fixed capital is embodied in a more permanent form, and fulfils its functions by repeated use. Circulating capital, on the contrary, is continually changing its shape or ownership. Machinery furnishes a conspicuous example of the first kind; materials transformed into manufactured goods are a typical illustration of the second. The distinction is one of degree rather than kind: for the most durable capital perishes in time; and, to some extent at least, all capital is continually being consumed and reproduced.

Another classification of capital has been based on the fact that it may be found in a form to satisfy wants either directly or indirectly—called *consumption* capital and *auxiliary* capital. When goods are made in anticipation of demand, when elaborate machinery is used to produce a great variety of distinct patterns, when a large number of workers of different degrees of skill and strength are collected in one building, the work of organization and direction grows more arduous and prominent; and the employer to whom this special duty falls has been separated by recent economists from the capitalist, who, whether distinct from or identical with him, furnishes the capital needed.

To create capital it is necessary that production should exceed consumption. In other words, men must pay regard to the future as well as to the immediate present, and must save accordingly. But to say that all capital is the result of abstinence or saving is misleading. The development of capital is the result of complex processes of discovery, accumulation, and adaptation, which must be studied from history. With the growth of modern invention the margin between what is produced, and what is reasonably necessary for the satisfaction of human wants, has vastly increased. Hence there has come about that immense development of capital with productive powers almost unlimited.

Capitalism is the name applied by socialists and collectivists to that condition of society in which capital belongs to private individuals, as opposed to the ideal state in which all means of production, including both land and capital, will be publicly owned. Socialists lay emphasis on the immense power afforded by capital in the so-called exploitation of the worker, who is dependent on the labor of his hands. See Economics; Interest; Labor; Land Economics; Profits; Wages. Consult E. von Böhm-Bawerk's *Capital and Interest* and *Positive Theory of Capital* (Eng. trans.); Karl Marx' *Capital;* Taussig's *Wages and Capital*; Mallock's *Critical Examination of Socialism.*

Capital Account is a statement of the resources of a company or business, consisting of moneys contributed by shareholders or lenders, and accumulations of income, which are laid out either in investments or permanent stock, including land. Expenses incurred in purchasing, renewing, and improving stock, losses on investments, etc., are charged against this account. The *Revenue Account,* on the other hand, deals with receipts obtained, and outlays, losses, etc., incurred in the actual working of the concern. It is highly important that these two accounts should be kept strictly separate, and that neither be credited or debited with sums which properly belong to the other. See Bookkeeping.

Capital of Corporations. In ordinary business usage, the capital of a corporation consists of its securities, at their par value. It includes not only the various forms of stocks, but the bonds issued by the corporation as well. Stocks and bonds not actually placed upon the market, but held in the corporation's treasury for sale in case of certain contingencies, are also reckoned as a part of the capital of the concern.

The capital of a corporation bears no close relation to the value of the property of the corporation. In some cases the total value of the property exceeds the aggregate capitalization, and in these the company is said to be under-capitalized. More frequently the capital exceeds the value of the property, when the corporation is said to be over-capitalized. See Corporation; Stock and Stockholders.

Capital Punishment, that form of punishment which deprives the offender of life. It includes all punitive methods of destroying life, though originally the term was restricted in meaning to the act of cutting off the head.

In the simple, homogeneous groups on the lowest cultural levels capital punishment was seldom inflicted. Occasionally members of those groups were put to death, but such acts were not clearly punishment; the purpose apparently being rather to purify the group or to make a sacrifice to the spirits than to make the individual suffer. If a person was found guilty of witchcraft, he was put to death, his body was buried in foreign soil, his property, wife, and children were destroyed, and even the use of his name was prohibited. But even this annihilation was for the purpose of wiping out a contamination, rather than of punishing the offender.

From the conditions existing in the lowest cultural groups to the present, no distinct trend has been apparent until the last century and a half. Rapid increases in the use of capital punishment were followed by rapid decreases. It has prevailed most in situations where internal conflict developed—as where by military power one group secured control over another or where there were marked differences in political loyalty or in religious belief—and in periods of great disorganization. It has also tended to flourish when the leaders have been isolated from the rank and file of the population by caste systems.

The use of the capital penalty is determined generally not by the material culture of any group or state, but by the social relations between the individuals of the group. When relations are intimate and the members are essentially of the same culture, there is little resort to this penalty; when there are artificial barriers between classes and when contacts are infrequent and lacking in intimacy, it can be inflicted by certain members upon others with little loss of equanimity. As democracy has spread, therefore, and human contacts have been facilitated by the development of means of communication, there has been a general tendency for capital punishment to wane. This tendency became apparent in different countries at different times. In Frankfort-on-the-Main, 317 persons were executed in the fifteenth century, 248 in the sixteenth, and only 140 in the seventeenth. In the cantons of Zürich and Schwyz, Switzerland, the number of executions was 572 in the sixteenth century, 336 in the seventeenth, and 149 in the eighteenth. In Great Britain, on the other hand, the number of crimes for which capital punishment might be inflicted was increasing during this period: there were only 17 capital offenses in the early part of the fifteenth century in England, but more than 200 in the last part of the eighteenth century, and it was not until 1839 that the number was as small as it had been four centuries earlier. Most of the capital offenses were added during the period of social disorganization incident to the industrial revolution, when property owners were clamoring for protection, and the common people were losing much of their respect for the old codes. But in spite of the great increase of offenses punishable by death it is probable that no great increase in legal executions took place. In the seventy-five years ended in 1814, about 25 per cent. of the capital penalties were executed, but in the period 1813–19 the percentage had dropped to 10, and in 1827–33 to 4. Sweden abolished capital punishment in 1921.

The methods of producing death have included beheading, hanging, burning, boiling, breaking on the wheel, strangulation, suffocation, burying alive, drowning, stoning, crushing, piercing, precipitation from a height, tearing apart, and combat in an arena. Impaling and immuring were abolished in Switzerland about 1400, execution by drowning in 1615. Burning at the stake was used in Berlin as late as 1786. In England boiling to death was abolished as a method of execution in 1547, and burning in 1790. In some cases the offender was first hanged and his body was then mutilated, but the general practice in England in later days was to gibbet the body, that is, hang it to the gallows in chains, frequently after soaking it in tar, so that it would remain for a long time as a warning to others.

In America there were at no time so large a number of offenses punishable by death as in England. Most of the colonies listed no more than twelve capital offenses at any time, though Pennsylvania once had as many as seventeen. The method of inflicting death during the colonial period was almost invariably hanging. Since the colonial period there has been a growing distaste for the use of capital punishment, evidenced by a somewhat constant reduction in the number of capital offenses: Ohio in 1788 limited the death penalty to murder; Pennsylvania did the same in 1794; Rhode Island in 1838 reduced the number of capital offenses from ten to two, and in 1892 the Federal Government reduced the number from seventeen to three. At present twelve States permit capital punishment for one offense only, eight restrict it to two offenses, and only two States list as many as six capital crimes.

Another indication of the present attitude in the United States is the movement toward total abolition of the death penalty. One State abolished the death penalty in 1847, four others were added to this list by 1876, one more in 1897, one in 1907, and eight between 1911 and 1917. This makes a total of fifteen States that have abolished capital punishment up to the present time, but its restoration in seven of the States, leaves only eight with absolute prohibition of the death penalty at the present time (1926). Of the seven that restored the penalty, five passed the law forbidding it during or just before the World War and restored it after a short experience, the average period before restoration being less than four years. No State that has gone as long as eight years without capital punishment has reverted to it.

The number of States that make capital punishment possible but not compulsory for any offense is increasing. In these States discretion is placed in the hands of the jury or of the judge. In 1918, twenty-four States were in this group; between 1918 and 1923 eight more were added, of which four had previously prohibited the death penalty, and four had required it for certain offenses. Still another tendency is toward reduction in the total number of legal executions. In some States, as Pennsylvania, this is not evident, but in the United States as a whole, it is certainly the case. In the five years ended in 1895, for example, there were 145 legal executions in the country; in the five years ended in 1917 only 96.

Efforts to secure methods that will produce death as swiftly and painlessly as possible and the tendency to exclude the public from executions show an increasing desire on the part of the people to mitigate if not entirely do away with capital punishment. In 15 States the death penalty is inflicted by electrocution (q.v.); in one (Nevada) by asphyxiation. In Utah the victim may choose hanging or shooting.

Capital punishment is the point at which the two principal theories of criminal law meet in conflict. Can society be more surely protected by treating the offender in a way designed to deter other prospective criminals, or by treating him in such a way as to prevent him from further crimes and develop him as far as possible along the lines of good citizenship? On this issue the controversy has settled into a difference of conclusions regarding the comparative deterrent effect of capital punishment and long-term imprisonment.

Evidence as to whether in the existing situation capital punishment is correlated with a lower murder rate than long-term imprisonment, is unsatisfactory. The only available figures are the statistics of homicides for the registration area of the United States; but since homicide includes excusable and justifiable killings, as well as murder and manslaughter, no conclusions on this basis can be regarded as more than approximations.

The homicide rate is almost exactly twice as high in the States that have retained capital punishment as in those that have abolished it. In 1922 the average homicide rate in the North Central States having the death penalty was 7.7; in the North Central States that had abolished the death penalty it was 4.4. The median homicide rate in 1922 in cities of 100,000 or more in States that had capital punishment was 8.1; in similar cities in States without capital punishment it was 6.5. In every such comparison that can be made, the general conclusion seems to favor the abolition of the death penalty. The probability remains, however, that in those States abolishing the penalty this step was taken for the very reason that the homicide rate was already low.

It is often claimed that some States which have abolished capital punishment have been compelled to restore it because of the great increase in murders, and that with the restoration murders have again decreased. The homicide statistics, however, are not in agreement with this assertion. In Missouri, for example, where the penalty was abolished early in 1917, the homicide rate that year was higher than it had been in 1916; it decreased in 1919 and 1920, after the death penalty was restored, but in 1918, the only complete year in which the death penalty was prohibited, it was almost exactly the same as in 1916 and in 1921, when the penalty was legal. Moreover, the changes that occurred in Missouri were almost exactly parallel to those that occurred in about half of the other States; in both direction and extent from 1916 to 1921 they were almost identical, year by year, with those of Ohio, though no action was taken in Ohio regarding the death penalty. The changes in the other States that abolished and restored the death penalty are of the same nature. Statistics, thus, furnish no justification for the contention that capital punishment as it now exists is a more effective deterrent from murder than is long-term imprisonment. The evidence, unsatisfactory as it is, points somewhat more definitely to the opposite conclusion, but it seems more reasonable to conclude that there is no appreciable difference in the deterrent effect of the two existing methods of dealing with murderers.

Other arguments than the general one discussed above in favor of capital punishment may be briefly summarized. It is maintained that the death penalty is less costly than the long-term segregation of prisoners; that the death penalty is a method of ridding society of defectives; that if the death penalty is abolished, lynchings will increase since the public demands the death of the murderer (though there is no statistical evidence in favor of this, and there is some evidence against it). It is further argued that unless murderers are put to death they will be released by pardon or parole, an argument which loses its force in view of the fact that in most of the States the pardon evil has been largely eliminated.

The principal arguments against capital punishment are as follows: It lowers the general appreciation of life; it makes the victims into heroes and martyrs for other criminals; the penalty is irreparable in case of error; it has a bad effect on the morale of the institution in which the penalty is inflicted; it is inconsistent with the general policy that is being developed for the treatment of offenders; it concentrates emotions on the evil that is already done rather than on the removal of the conditions which produced the evil; it is the primary reason for delay and inefficiency in the existing courts.

Consult Liepmann's *Die Todesstrafe* (1912); *Handbook on Capital Punishment, Prison Leaflets No. 38*, by the National Committee on Prisons and Prison Labor (1916); *Bulletin 25*, on *Capital Punishment*, of the Mass. ConstitutionalConvention(1917); Bye's *Capital Punishment in the United States* (1919); Lawes' *Man's Judgment of Death* (1924); Gillin's *Criminology and Penology* (1926).

Capitals (*majuscula*), in contradistinction to Small Letters (*minuscula*), are larger and differently shaped letters employed in writing and printing to help the eye, to relieve the uniformity of the page, to increase the facility of keeping and finding the place, to mark the beginnings of sentences, proper names, etc. Among the ancients, and during the earlier part of the Middle Ages, no distinction between capitals and small letters was known; in a sense, writing was originally all capitals.

In English printing and writing, capital letters are now employed as the initial letters of words which have some special distinction—all proper names and their derivative adjectives, all nouns which refer to the Divine Being, the pronoun I, the first words of new sentences and of lines of poetry. Official titles and the technical words of a treatise may be singled out by the use of an initial capital. In headings and in book titles whole words are printed in capitals, and even the first word of a chapter or paragraph may be printed in the same way.

In German all substantives begin with a capital letter, but adjectives formed from proper names, as *englisch, französisch*, and the like, are not generally capitalized. The French use capitals sparingly.

SMALL CAPITALS are so called as being smaller than the initial capitals. See ALPHABET.

Capital Stock. See STOCK AND STOCKHOLDER.

Capito, kä'pē-tō, or KÖPFEL, WOLFGANG FABRICIUS (1478–1541), German reformer, was born in Alsace, entered the Benedictine order, and became professor of theology at Bâle (1513). He approved of Luther's action, but nevertheless in 1519 entered the service of Albert of Mainz; and it was not till some years later that he finally declared for the Reformation. He was a member of the conferences of Zürich and Marburg, and in 1530, with Bucer, he prepared the *Confessio Tetrapolitana*, the confession presented to the Diet of Augsburg by the four cities of Strassburg, Constance, Memmingen, and Lindau, a few days after the presentation of the *Confessio Augustana* of the Saxon theologians.

Capitol (Latin *Capitolium*), the great national temple of ancient Rome, situated on the southern summit of the Capitoline Hill—*Mons Capitolinus*. The hill terminates at its southern extremity in a precipice with an abrupt fall of 80 feet—the 'Tarpeian Rock,' over which state criminals were thrown. On its northern summit stood the *Arx* or citadel of Rome, the site of which is now occupied by the Church of S. Maria in Araceli. On the Capitoline Mount was also the temple of Jupiter Tonans, built by the Emperor Augustus; and the magnificent *Tabularium*, built by Quintus Catulus, 73 B.C., in which the archives were kept.

The Capitol was founded by Tarquinius Priscus, and completed by Tarquinius Superbus. It was burned down during the civil wars (83 B.C.), was rebuilt by Sulla, was burned again by the soldiers of Vitellius (69 A.D.), rebuilt by Vespasian, but burned a third time in the reign of Titus (80), and splendidly restored by Domitian, whose structure lasted to a late period of the empire. In the Capitol the Sibylline books were stored, and here the consuls on entering upon office offered up sacrifices and made their vows; hither also the victorious general on his triumph was borne in his triumphal car to give thanks to Jupiter.

The modern Capitol (*Campidoglio*), built on the site, and part of the basement of the ancient Capitol, was designed by Michelangelo, but is one of his inferior works. It comprises the Palazzo Senatorio, the Capitoline Museum, and the Palazzo dei Conservatori.

An account of the United States Capitol is given in the article on WASHINGTON; the State capitols are described in the articles on the capital cities.

Cap'itoline Games, games instituted at Rome by Camillus (390 B.C.), in honor of the preservation of the Capitol from the Gauls. After a period of discontinuance, they were again instituted as a quadrennial event by Domitian, 86 A.D.

Capitoline Hill. See CAPITOL.

Capit'ularies, a term applied to certain edicts issued by the Frankish kings. They are distinguished from other classes of mandates by their division into chapters and by the fact that they are attested by no seals or signatures. They were probably put into execution by the rulers in person and attained their greatest importance under Charlemagne and Louis the Pious. They contain regulations for all departments of secular and ecclesiastical life, instructions for officials, particularly the *missi dominici*, and modifications of the old tribal law. A first collection of them was made in the ninth century by Ansegis, an abbot of Fontanelle. Modern editions have been published by Baluze (1687) and Boretius (1883).

Capit'ulation, the act of surrendering to an enemy upon specified terms contained in a convention or other instrument, also known as a capitulation. Such agreements being made by virtue of an implied power confided to generals and admirals, do not as a rule require the ratification of the supreme power unless such ratification is expressly reserved in the act itself. Being bargains in the common interests of both contracting parties, they vary greatly according to the condition of the party contemplating surrender and the generosity of the victor. The surrendering force may become prisoners of war with certain privileges, or may be sent home on undertaking not to bear arms for a limited period; the inhabitants of a besieged place may be promised security of religion and of private property. Under more honorable forms of capitulation, the garrison of a besieged fortress may march out with 'honors of war,' leaving the fortress and its warlike material in the hands of the victor. A stipulation affecting the political constitution or administration of a place, or for a perpetual cession of it, is *ultra vires*, and amounts to a *sponsion*, which must be confirmed by express or tacit ratification.

The Brussels Conference of 1874 laid down (Art. 46) the following rules to regulate capitulations:—'The conditions of capitulations shall be discussed by the contracting parties. These conditions should not be contrary to military honor. When once settled by convention, they should be scrupulously observed by both sides.' See International Law.

The term capitulation is also applied to an arrangement between Christian and non-Christian, or civilized and semi-civilized powers, by which the latter surrender to the former the civil and criminal jurisdiction they would naturally possess over the subjects of such Christian or civilized powers resident among them. A notable example is furnished by the capitulations whereby Turkey formerly extended extra-territorial rights and privileges to foreigners resident within its boundaries or in its dependencies. These were discontinued by the Treaty of Lausanne (1923).

Capiz, kä'pēth, province, Philippine Islands, occupying the northern coast of the island of Panay, on the Visayan Sea; area 1,661 square miles, including adjacent islands. A semicircular range of high mountains, enclosing a low and fertile plain, separates it from Iloilo and Antique, the other two provinces of the island. The Capiz, or Panay, the principal river, is navigable well into the interior for large native craft. Sugar, corn, rice, indigo, hemp, chocolate, and cattle and horses are produced. Gold and iron are found, and portions are thickly wooded. The leading manufactures are alcohol, silk, cotton, sacks, hats, baskets, hemp, and wine. The capital is Capiz, 242 miles southeast of Manila. Pop. (1918) 283,975.

Capiz, pueblo, capital of the province of Capiz, Panay, Philippine Islands, on the left bank of the Capiz River, 4 miles from its mouth. The river is navigable to the city, which is a port of call for steamers. Rice is exported. Pop. (1918) 22,022.

Caplin. See Capelin.

Capmany y Montpalau, kap-mä'nē ē mōn-pä-lä'o͞o, Antonio de (1742–1813), Spanish man of letters, was born in Barcelona. His principal works are *Teatro historico critico de la elocuencia castellana* (1786–94), *Filosofia de la elocuencia* (1777), and *Memorias historicas sobre la marina, comercio y artes de la antigua ciudad de Barcelona* (1779–92).

Cap Martin, kap mär-tań', a winter health resort on the Mediterranean coast of the French department of Alpes-Maritimes, situated between Mentone and Monaco.

Cap'nomancy, divination by observation of the smoke from incense or a sacrifice. Thin smoke ascending directly was interpreted as a favorable augury.

Capodistria, kä-pō-dēs'trĭ-ä, town, Italy, in Istria (anc. *Ægida* and *Justinopolis*), 9 miles south of Trieste. It is an attractive town of Venetian aspect, built on a small rocky island connected with the mainland by a causeway. The Cathedral is a beautiful Gothic building with a fine campanile. The chief industries are fishing, preparing salt from sea water, and fruit growing. In 1278 Capodistria came under Venetian rule; in 1797 it became an Austrian possession, and after the Great War was restored to Italy. Pop. (1920) 8,192.

Capo d' Istria, kä'pō dēs'trē-ä, or Capodistrias, John Antonio, Count (1776–1831), Greek political leader, was born in Corfu, studied medicine, but devoted himself to politics. He held various important positions in the Ionian Islands during their occupation by the Russians (1802–7), and on their reversion to France, after the Treaty of Tilsit (1807), entered the diplomatic service of Russia, becoming, conjointly with Count Nesselrode, secretary for foreign affairs. In 1827 he was elected president of Greece. His administration was marked by scenes of strife, jealousy, and suspicion, his undoubted Russian bias led to popular dissatisfaction, and on Oct. 9, 1831, he was assassinated by Constantine and George Mavromichalis, brother and son of a man whom he had imprisoned. Capodistria was a man of high ambition, intense patriotism, and good moral character, but his strict ideas and lack of sympathy with the lax methods then prevailing, made his administration a virtual failure.

Cappadocia, kap-*a*-dō'shĭ-ä, a division of Asia Minor, varying in extent at different periods in its history. It is said to have been originally inhabited by a Hittite population, probably mixed with Semitic Syrians. After 560 B.C. it became part of the Persian Empire and remained so until about 330 B.C., the time of Alexander's conquests. For a time it belonged to the Syrian kingdom, and was then governed by independent kings. On the death of King Archelaus at Rome, A.D. 17, the Emperor Tiberius made it a Roman province. In Roman times it extended north to Pontus, south to Cilicia and the Taurus mountains, east to Armenia, and west to Lycaonia and Galatia. The chief cities were Mazaca (afterwards known as Cæsarea), Tyana, and Melitene.

Cappel, kä'pel, or Kappel, village, Switzerland, in the canton of Zürich, 10 miles south of Zürich. It is celebrated as the scene of the death of Zwingli (q.v.), the leader of the Protestants, on Oct. 11, 1531, when he was engaged against the Roman Catholic forces. Pop. (1920) 641.

Cap'pon, James (1855–), Canadian writer and educator, was born in Dundee, Scotland. He was educated in Glasgow University and, after spending two years in Italy studying modern languages and lecturing on English literature, became corresponding tutor in Queen Margaret's College, Glasgow. In 1888 he was appointed professor of English language and literature in Queens University, Kingston, Ont. He is one of the editors of the *Queen's Quarterly Magazine.* His published works include: *Britain's Title in South Africa, Studies in Canadian Poetry, The Sectarian Principle in the Canadian Constitution, What Classical Education Means, Charles G. D. Roberts* (1924).

Capponi, käp-pō'nē, Gino, Marchese (1792–1876), Italian statesman and historian, was born in Florence. After travelling for a time in England, he settled in his native city and founded, first, the *Antologia Italiana,* modelled upon the *Edinburgh Review,* and later the *Archivio Storico Italiano.* In 1848 he became for a time the head of the government of Tuscany, and in 1860, after the unification of Italy, was made a senator. Although he had become blind, he assisted in the preparation of the *Vocabolario* of the Accademia della Crusca, and of the improved edition of Dante's *Commedia.* His most important work is *Storia della repubblica di Firenze.*

Capps, Edward (1866–), American educator, was born in Jacksonville, Ill. He was graduated from Illinois College in 1887, was an instructor in Latin at Yale University (1890–92), and in 1892 became professor of Greek language and literature in the University of Chicago. In 1907 he left Chicago to accept the professorship of classics in Princeton University. In 1918 he was appointed trustee and chairman of the managing committee of the American School of Classical Studies in Athens. He was American Red Cross Commissioner to Greece in 1918–19, and Envoy Extraordinary and Minister Plenipotentiary to that country in 1920–21. Among his numerous publications on the classics are: *From Homer to Theocritus; Chronological Studies in the Greek Tragic and Comic Poets; The Plot and Text of Menander's Epitrepotes.*

Caprera, kȧ-prā'rȧ ('goat island'), a bare, rocky island off the northeast coast of Sardinia. It has an area of about 10 square miles and is connected with the island of La Maddalena by a swing bridge. It was the favorite residence of Garibaldi during the last thirty years of his life. and there he died in 1882. His home, Casa Bianca, has been arranged as a museum.

Capri, kä'prē, Italian island, in the Bay of Naples; 20 miles south of Naples. It is about 4 miles long and 2 miles wide, with a rugged surface and precipitous coasts abounding in caves and fantastic rocks; area 5¾ square miles. The highest point is Mount Solaro (1,920 feet), in the western part. Capri is famous for its sunshine, pure air, and luxuriant vegetation, and is a favorite resort of foreigners as well as of Neapolitans. Features of interest are the Blue Grotto, a cavern entered by a low, narrow opening from the sea, filled with a strange blue light; the villas of Tiberius now in ruins; a ruined castle; and the Arco Naturale, a fantastic archway in the rocky cliffs. The chief industry is fishing; fruit, oil, and wine are produced. Capri and Anacapri are the principal towns.

Capri was undoubtedly inhabited in prehistoric times. It was once Greek, and later Roman, being long the home of Tiberius. In 1806 it was taken by the British, in 1808 retaken by the French, and in 1813 restored to Ferdinand I. of the Two Sicilies. Pop. (1920) 6,858.

Capriccio, kä-prĕt'chō, or Caprice, in music, a form of composition not governed by any set rules. The term is also applied to a painting or engraving made under like conditions.

Capricor'nus, an ancient constellation, and the tenth sign of the zodiac, that of the winter solstice. Its symbol is ♑. Its premier star is a naked-eye pair, composed of a_1 and a_2 Capricorni, of third and fourth magnitudes respectively. The former is telescopically double, the latter closely triple.

Cap'rification, a process of pollination essential to the development of the Smyrna fig, consisting in the transfer of pollen from the wild fig or caprifig, known also as the male fig, by a small insect, *Blastophaga grossorum.* Most fig growers concede that for every hundred Smyrna trees there should be from three to five caprifig trees planted, preferably in one corner or side of the orchard, toward the prevailing wind. Various containers, as wire or wooden baskets, are used to distribute the caprifigs through the orchard, or the figs, strung on string or raffia, are hung on the limbs of the trees to be fertilized. The pollen-laden insect crawls from the caprifig to the Smyrna fig, and fertilization ensues. Caprification has been successfully introduced into California.

Cap'rifolia'ceæ, the Honeysuckle family, a family of annual and perennial herbs, shrubs, and trees, of wide distribution. They have opposite leaves and flowers arranged in heads or whorls. Among the genera are Lonicera, Linnæa, and Viburnum.

Caprivi de Caprara de Montecuculi, kä-prē've dä kä-prä'rä dā mōn-tā-kōō'kōō-lē, Count Georg Leo von (1831–99), German Chancellor, was born in Charlottenburg. He served with distinction in the Danish (1864) and Austrian (1866) campaigns; and in the Franco-German war of 1870 he acted as chief of staff to the 10th Army Corps, distinguishing himself in the battles of the Loire. In 1884 he succeeded Von Stosch as head of the Admiralty, which service he reorganized. On Bismarck's retirement, in March, 1890, General von Caprivi became Imperial Chancellor and Minister for Foreign Affairs. In 1892–3 he passed the German Army Bill; but in October, 1894, he suddenly resigned, owing to friction with Count Eulenberg on the question of the Agrarian League malcontents.

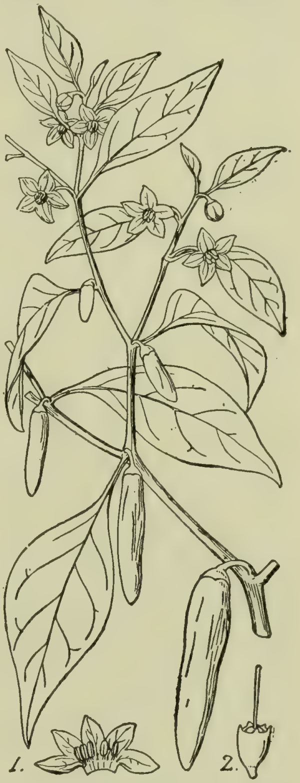
Capro'ic Acid is known in eight isomeric forms. Normal caproic acid, C_5H_{11} COOH is one of the products of the butyric fermentation of sugar. It can be made by the oxidation of hexyl alcohol and is an oily liquid with a faint disagreeable odor. Its specific gravity is .945 at 0° C.; melting point − 2° C., and boiling point 205° C.

Capron, kā'prun, Allyn (1846–98), American soldier, son of a hero of the Seminole and Mexican wars, was born in Tampa, Fla. He was graduated (1867) from West Point, receiving a commission in the 1st U. S. artillery regiment, and acquired a high reputation as an artillerist. His service was principally in the West, and he distinguished himself at the battles of Wounded Knee and Drexel Mission in the campaign of 1890 against the Sioux. In the Spanish-American War, he took part in the Cuban campaign, and opened the siege of Santiago, at El Caney, also witnessing its surrender. He died soon afterward from typhoid fever contracted in Cuba.

Allyn Kissam Capron (1871–98), his son, commissioned second lieutenant of cavalry, 1893, was made a captain in the 'Rough Riders' and was mortally wounded at the battle of La Guasima, being the first American officer killed in the Spanish American War.

Capsella. See Shepherd's Purse.

Cap'sicum, a genus of tropical shrubs belonging to the order Solanaceæ, including about 90 species, all indigenous to tropical America. They grow to a height of from one to six feet, and have small greenish white flowers and simple ovate leaves. The fruit is a long, membranaceous pod, variable in shape and size, generally red when ripe, and commonly known as red or cayenne pepper. The fruits are dried and exported as capsicums, chillies, or, when powdered, as cayenne pepper. The green fruits are sometimes pickled and are used for making chilli vinegar. When used with meat they form the Mexican 'tamale.' The best known species, *C. annuum,* has many varieties, chief of which are *C. conoides,* an extremely acrid variety known as tabasco; *C. grossum,* with large, fleshy, firm fruits, mild in flavor, known as bell pepper; and *C. cerasiforme,* with a small, extremely pungent fruit. The dried fruit of *C. frutescans* is used medicinally, especially as a rubefacient and local stimulant in neuralgia and rheumatism.



Capsicum

1. Corolla. 2. Calyx, with ovary and pistil

Cap'stan, a machine for raising heavy weights, especially on shipboard. A ship's capstan was formerly a massive column of timber, cylindrical in form but smaller at the centre than at either end, and having its upper part pierced with holes to receive the bars or levers. It worked on a spindle fastened to the deck below, and was used for winding a cable in or out, or for any other purpose where extraordinary effort was necessary, as for hoisting heavy cargo or masts. With the introduction of steam, capstans were made of iron or steel instead of wood, although they were, as a rule, still fitted in such a manner as to be worked alternatively by means of bars manned by part of the crew. In modern ships electrically-driven capstans are generally used, but much of the work formerly done by upright capstans is now performed by means of steam winches with a horizontal axis.

Cap'sule, in botany, the name given to those fruits which, when they are ripe and dry, open to allow the seeds to drop out. See FRUIT.

Capsule, in anatomy, the membranous covering surrounding such organs as the spleen and kidney.

Captain, a military officer holding intermediate rank between a first lieutenant and a major in the U. S. Army, the command corresponding to the grade being a company, troop, or battery. The captain is responsible for the appearance, instruction, drill, discipline and efficiency of his command; for the care and preservation of its equipment; and for the proper performance of duties connected with its subsistence, pay, clothing, company funds, accounts, reports, returns, etc. He requires his lieutenants to assist in the performance of all company duties; selects the non-commissioned officers, who are appointed by the next higher administration commander; appoints the first sergeant, quartermaster sergeant, cooks, mechanics, musicians, etc., etc. Captains in the U. S. Army are often post commanders. In European armies, where companies are larger, all captains are mounted.

A captain in the U. S. Navy has the assimilated rank of colonel in the army, and his corresponding command is a war vessel, senior captains generally commanding battleships, and those lower on the list vessels of various classes. A naval captain's duties in reference to his command are similar to those of an army captain, but involve a far higher degree of responsibility for life and property.

Caption, the title or heading of a legal paper, designed to show the authority by which it is issued. It is used in indictments, depositions, etc., but is no part of the indictment itself. In Scotch law a caption is a warrant for the apprehension of a debtor.

Capua, kap'ū-*a*, town and episcopal see, Italy, in the province of Caserta, on the Volturno River, 20 miles northwest of Naples. The chief features of interest are the cathedral, founded in 856 but with the exception of the beautiful campanile almost entirely rebuilt; the museum, with valuable sculptures; and the fine bridge across the Volturno, built by Trajan. Pop. (1920) 9,832.

The ancient city of Capua, once a rival of Rome, and long famous for its luxury, was founded by the Etruscans, about 3 miles to the south of the modern town. The basis of its wealth lay in its flourishing industries — its purple stuffs, leather goods, scarlet dyes, and fine linens—and the extraordinary fertility of the adjacent Campanian plains. It was famous, also, for its pottery, its horses, and its perfumes, and was the seat of a celebrated gladiators' school. The revolt of the gladiators under the leadership of Spartacus broke out here in 73 B.C. Capua allied itself with Rome in 343 B. C., but in 216 espoused the cause of Hannibal, for which, in 211, it was sternly punished by Rome. Cæsar helped to reëstablish it, and its prosperity lasted until the barbarians overran Italy. After being devastated successively by Goths, Vandals, and Longobards, the city was finally destroyed by the Saracens in 840; the modern city was founded about sixteen years later. In 1860 Garibaldi and his forces defeated the Neapolitans outside Capua.

Capuana, kä-po͝o-ä'nä, LUIGI (1839–1918), Italian novelist and critic, was born in Mineo in Catania (Sicily). His dramatic and literary criticisms have been collected in *Il teatro italiano contemporaneo* (1872); *Studi sulla letteratura contemporanea* (1880–87); and *Libri e teatro* (1892). As a novelist he ranks among the foremost realists, his best-known work being *Giacinta* (1879). Other works include two charming volumes of fairy tales, one of which, *C'era una volta* (1882) has been translated into English (*Once upon a Time*, 1892); *Semiritmi* (1888); *Il piccolo archivio* (1886); *Passa l'amore* (1908).

Capuchin Monkey, kap-ū-shēn', or SAPAJOU, a name sometimes restricted to *Cebus capucinus*, sometimes applied generally to the whole genus *Cebus*, because of the cowl-like appearance of the hair on the forehead. All the species are restricted to tropical America, and resemble other New World monkeys in the possession of prehensile tails, six cheek teeth at each side above and below, the broad division between the nostrils, and absence of cheek pouches. They vary in color from almost black to a reddish-brown. They are the most docile and easily taught of all American monkeys. *Cebus capucinus* is the monkey most often seen in travelling shows and accompanying itinerant organ players. See MONKEYS.

Capuchins, a branch of the Franciscan friars, founded about 1525 by Matteo da Bassi, who advocated a return to the observance of the most rigid rules of St. Francis. In 1528, Pope Clement VII. issued a bull authorizing them to wear the pyramidal hood (*capuccio*), to go barefoot, to grow beards, and to live as hermits. The order has always been a prominent one, numbering among its members many men of wealth and education. It reached its zenith in the 18th century, but suffered severely in the suppression of the monastic orders in France and Germany. It has two provinces in the United States (Detroit and Pittsburg). An order of Capuchin nuns was founded in Naples in the 16th century, but strictly speaking it is a branch of the order of St. Clare (q.v.). See also FRANCISCANS.

Cap'ulets, a noble family of Verona (Italian Cappelletti), which with the Montagues (Montecchi) figures in Shakespeare's *Romeo and Juliet*. The story of the feud between the families and the love of Romeo and Juliet seems to have been widely current in the 16th century, and it probably was from Arthur Brooke's versified translation (1562), through the French, of Bandello's Italian novel, that Shakespeare drew his plot.

Capybara, kä-pē-bä'rä, or CARPINCHO (*Hydrochœrus capybara*), the largest living rodent, allied to the cavies and the guinea-pigs, and found only in South America. It is a heavily built animal, about four feet in length, covered with coarse, bristly, reddish-brown hair, and in general appearance meriting the

Capybara

often applied name of 'water-hog.' It has short stout legs with webbed feet and hoof-like claws, a broad flat head, and practically no tail. It swims swiftly, though its movements on land are relatively slow. Its food consists chiefly of water plants, and it haunts low, swampy ground in the vicinity of rivers and lakes.

Caraballos Occidentales, kä-rä-bäl'yōs ok-sē-den-tä'läs, one of the three great mountain ranges of Luzon, Philippine Islands. It lies west of the median line of the island, and extends from Nueva Ecija to Point Mayaira, Ilocos Norte, the northernmost point of Luzon. It is divided into the Cordillera del Norte and Cordillera Central, the former being only a small part of the total chain. The ridges of Pinos and Bayabas in Benguet are west of the main range. Further north two great ridges enclose the province of Abra. The highest peak is about 8,000 feet.

Caraballos Sur, kä-rä-bäl'yōs sōōr, the third mountain range of importance in Luzon, Philippine Islands. It extends from the northern boundary of Nueva Ecija south and southeast through the great peninsula of Luzon to the strait of San Bernardino.

Carabao, kä-rä-bä'ō, the domesticated water buffalo of the Philippine Islands. It is a variety of Asiatic buffalo (q.v.), is grey or reddish grey in color, and has long horns curving backwards. It is used by the natives for drawing carts and carrying burdens as well as in ploughing and other farm-work.

Carabidæ, k*a*-räb'i-dē, a family of beetles, which includes all the common ground beetles, numbering some 12,000 species. The majority are carnivorous, living chiefly on other insects, especially grubs. Many of the forms have no wings, or mere rudiments of wings, and all are largely terrestrial in habit. They are to be found under stones and fallen logs, in gardens, woods, and fields.

Carabiniers, kar-*a*-bi-nērz', or CARBINEERS, originally mounted French soldiers armed with carbines, one company of which was maintained in each cavalry regiment. In the late seventeenth century they were united into one body known as the Royal Carabiniers. In the British army the name is applied to the 6th Dragoon Guards; in Italy the gendarmerie are known as carabinieri.

Carabobo, kä-rä-bō'bō, state, Venezuela, in the northern part, extending from the sea inland; area 2,984 square miles. The mountain slopes are often forest covered. The southern part is densely peopled, and produces excellent coffee, fruit, sugar, maize, rubber, and dyewoods. The capital is Valencia. Pop. (1920) 125,514.

Caracal, kä-rä-käl', CARACUL, or PERSIAN LYNX (*Felis caracal*), a small carnivore of the cat family found widely distributed throughout Southern Asia and Africa. It is a handsome animal, bright reddish brown above and paler below, with black ears and a long tail. Like the other true cats, it is actively carnivorous in habit, but is easily tamed. It is approximately the size of a fox, the body length being between 2 and 3 feet. It resembles the lynx in appearance, but its tail is longer, it has no ruff, and its fur is less close and thick. Its pelt is classified among the cheaper varieties of fur.

Caracal

Caracal, town, Roumania, 95 miles west of Bucharest. It was named for the Emperor Caracalla. Pop. 13,000.

Caracalla, kar-*a*-kal'*a* (188-217), emperor of Rome from 211 to 217, was a son of Septimius Severus; he was named originally Bassianus, then took the name Marcus Aurelius Antoninus, but was nicknamed Caracalla from his fondness for wearing the long Gallic tunic. In 208 he accompanied his father to Britain, and on the latter's death at York, in 211, became co-emperor with his brother Geta. On their return to Rome, Caracalla's violent temper began to be manifest and after having brutally murdered Geta and all those who had favored him, he visited Gaul, Germany, Dacia, Thrace, Asia, Syria, and Egypt, marking his progress by wanton massacre. While he was preparing for another expedition beyond the Tigris, Macrinius, the prætorian prefect, instigated his murder at Edessa. Caracalla is generally said to have conferred the Roman franchise on all inhabitants of the empire in order to extract money from the provinces. He built at Rome the famous Thermæ Caracallæ, the ruins of which are still extant; also the triumphal arch of Septimius Severus.

Caracara, kä-rä-kä'rä, the name given to various vulture-like, carrion-eating hawks of Central and South America. They are handsome birds from twenty to twenty-five inches long, dark brown or blackish, mottled with white, with long, naked legs and a somewhat crested head. Their food consists largely of carrion, and they are useful as scavengers, gathering in great flocks where food is plentiful. The nest, a large, somewhat slovenly affair, is built in trees or bushes. The best known species is *C. cheriway*, found in the Southern United States and in Guiana and Ecuador. It is a rather shy bird of terrestrial habit, strong in flight, and an exceedingly swift runner.

Caracas, kä-rä'käs, town, capital of Venezuela; 8 miles south of its port, La Guaira, with which it is connected by a narrow-gauge line crossing the coastal range by the Catia Pass, 3,100 feet high. Features of interest are the capital, a large building in semi-Moorish style; the episcopal palace; the university, museum, and library; the cathedral; school of fine arts; and residence of the president, the Yellow House. A statue of Simon Bolivar stands in the Plaza Bolivar, and on a hill west of the city are the observatory and Independencia Park, from which a fine view of the city is obtained. The immediate surroundings constitute the Federal district, 45 square miles in area. The leading industrial establishments are breweries, furniture and tobacco factories, and foundries. Exports include coffee, cocoa, and tobacco. The city was shaken by a severe earthquake in 1812, and again in October, 1900. Pop. (1920) 92,212.

Caracci. See CARRACCI.

Caracciolo, kä-rät'chō-lō, PRINCE FRANCESCO (1752-99), admiral of the 'Parthenopeian Republic,' which succeeded the kingdom of Naples in 1799. He repelled every attempt at landing made by the Sicilian-English fleet, was betrayed, after the capture of Naples, tried by court-martial, and hanged.

Caracoles, kä-rä-kō'lās, town, Chile, in the province of Antofagasta, 100 miles east of Antofagasta. It has exceedingly rich silver mines. Pop. 4,500.

Caractacus, ka-rak't*a*-kus, son of Cunobelinus, a king of the Silures in Britain, made a vigorous resistance to the Romans during the reign of Claudius. Betrayed to the Romans, he was taken to Rome to grace the triumph of Claudius, and appears to have ended his days in Italy.

Caracul. See CARACAL.

Caraffa, kä-rä'fä, a noble

Neapolitan family, three members of which, Carlo (1519–61), Antonio (1538–91), and Giovanni, were entrusted with the temporal administration of church affairs. The ablest, Carlo, served in the armies of Charles v. of Germany and Henry II. of France, and became a cardinal. Their uncle, Pope Paul IV., stripped the Colonnas of their possessions to enrich his nephews but subsequently was compelled by public opinion to banish them from Rome. His successor, Pius IV., caused them to be put to death. Another member of the family, Antonio (d. 1693), was an Austrian field-marshal. As governor of Hungary, he presided over the tribunal of Eperies, which tried the partisans of Tököly (q.v.). So great was his cruelty that his name was execrated in Hungary, and he was recalled in 1687. He was sent as commandant to Transylvania, and defeated the Turks at Munkács, in 1688.

Caraman. See KARRAMANIA.

Carambola, kar-*am*-bō'l*a* (*Averrhoa carambola*), known also as the COROMANDEL GOOSEBERRY, a small evergreen tree, cultivated in India for its edible fruits. It grows to a height of about 30 feet, bearing short racemes of white or purplish flowers, followed by oval yellow fruits, about the size of an orange, smooth and thin-skinned, and having five angles or ribs. The pulp is clear and watery, pleasantly acid in some varieties, sweet in others. The carambola is also cultivated in Southern China, the Philippine Islands, Hawaii, Brazil, and occasionally in Southern Florida. The fruit is used for jelly and pickles and is preserved and exported. The Blimbing (q.v.) is a related species.

Car'amel, the brown or black substance produced by heating sugar over a slow fire. It can be made also by roasting sugar-containing substances, as coffee or chicory. It is soluble in water and the solution is largely used in coloring wine, beer, candy, ice cream, and other articles. The chemistry of caramel is little known. Three bodies, known as caramelin, caramelan, and caramelen, have been isolated, all of which are soluble in water.

Caranaiba Palm. See CARANAUBA.

Caran d'Ache. See POIRÉ, EMMANUEL.

Carapa, kar'*a*-pa, a genus of tropical trees, of which the best known is *C. guianensis*, a native of Guiana, where it reaches a height of fifty feet. It has pinnate leaves and bears fruit as large as oranges, with a characteristic subacid flavor; its bark is esteemed as a febrifuge, and its seeds yield a thick oil used in lamps. From an African species (*C. procera*) an oil is obtained with which the natives anoint the body to protect it against insects; they also burn it, and use it for making soap.

Carapegua, kä-rä-pä-gwä', town, Paraguay, 38 miles southeast of Asunción. It is situated in a rich cotton and sugar district. Pop. 13,000.

Caraquet, kar-*a*-ket', town, Canada, Gloucester county, New Brunswick, on Chaleur Bay and on the Canadian National Railroad; 160 miles northeast of Fredericton. It is a port of entry and has fishing industries. Pop. (1911) 2,845.

Car'at, (1) a unit used in weighing gems. The United States and many other countries now use the metric carat of 0.2 gram, or about 3.1 troy grains. (2) The proportion of pure gold in an alloy, expressed as twenty-fourths of the whole. Thus, 18-carat gold is 18-24 pure gold.

Carausius, ka-rō'shi-us, MARCUS AURELIUS VALERIUS (?250–293 A.D.), Roman general, a native of Menapia (Belgium), who distinguished himself against the revolted Bagaudæ in Gaul, and was entrusted by the emperor Maximian with the protection of the coasts of Britain and Gaul from the inroads of Frisian pirates. But Carausius, by liberal gifts to the invaders, attached them to his interests and made himself master of Britain, assuming the title of Augustus (287). He was assassinated by one of his officers, Allectus.

Caravaca, kä-rä-vä'kä, town. Spain, in the province of Murcia, 40 miles northwest of Murcia. It is situated in a valley surrounded by mountains, and dominated by the ruins of a mediæval castle. The parish church contains a sacred cross famed for its healing powers, in honor of which a yearly festival is held. There are important jasper quarries in the district. Caravaca is an ancient town of the Knights Templars, remains of whose occupation still exist. Pop. (1920) 18,854.

Caravaggio, kä-rä-väd'jō, town Italy, in the province of Bergamo, 23 miles east of Milan. It is celebrated for the church of L'Apparizione della Madonna, a place of pilgrimage, and as the birthplace of two Italian painters both known as Caravaggio—*viz.*, Polidoro Caldara (born 1495) and Michelangelo Amerighi (born 1569). Pop. 9,000.

Caravaggio, MICHELANGELO AMERIGHI DA (1569–1609), Italian painter, was born in Caravaggio, near Milan, and as a boy was employed in preparing plaster for the Milanese fresco painters. Having determined to become an artist, he set himself, without any instruction, to copy in minute detail the works of nature, and this practice he pursued to the end of his life. He spent some time in Venice, where he made a careful study of the work of Giorgione, and later was in Rome, where he enjoyed a period of great popularity. His ungovernable temper involved him in continual quarrels, and he was at various times forced to flee his place of abode. On the last of these occasions, when on his way to Rome, he fell ill in Porto Ercole and there died. Caravaggio may justly be called the founder of the Naturalistic School, but his chief claim to fame lies in his mastery of color and disposition of light and shade. Among his best works are *Christ and the Two Disciples at Emmaus; Death of the Virgin; The Fortune Teller; Ecce Homo; Martyrdom of St. Peter; The Entombment.*

Caravaggio, POLIDORO CALDARA DE (*c.* 1492–1543), Italian painter, was born in Caravaggio near Milan. His parents were very poor and at an early age he went to Rome to seek employment. While engaged in carrying mortar for the fresco painters of the Vatican, he attracted the attention of Raphael, whose pupil he became and under whose guidance he executed several frescoes in the Vatican. His greatest picture, *Christ bearing the Cross*, is now in the museum of Naples. Other works are *Psyche Received into Olympus; Cephalus and Procris; Passage of the Red Sea.*

Car'avans, the name given to travelling companies of traders or pilgrims in the Far East, especially those crossing the deserts of Asia and Africa. One of the earliest accounts of such a caravan is found in Genesis, where it is recorded that Joseph was sold by his brethren to a caravan of Midianites (Gen. xxxvii. 25–28). The rise of Islam in the seventh century led to the institution of the annual pilgrimage to Mecca, and devout Moslems make up the most celebrated caravans of the present day, while the roads from Basra, Suez and Bagdad to Mecca are among the most important caravan routes.

Caravans usually have stated times and places for assembling and departing. There is a leader, who is assisted by guides, military escort, and servants, and large consignments of merchandise are carried besides the necessary provisions and clothing. Great camel trains are a feature of the caravan. Sometimes the animals number as many as 1,000, following each other in single file, and travelling at the rate of about 2 to 2½ miles an hour, according to the load carried.

Most of the ancient caravan routes of Asia and Africa are still in use, with their recognized camping-places or 'desert stations,' usually beside a well (see CARAVANSARY). In the Sahara, where the Tuaregs are the great trading caste, there is a much travelled track from Morocco, by Tenduf, leading southeast to Wady Teli, where it meets the more northerly line from El Harib, and the main road is prolonged southward to Timbuktu. Another great road runs due north from Lake Chad to Tripoli; another stretches eastward from Tafilet, in Morocco, to Cairo; while another minor track winds for 150 miles from Keneh, on the Nile, to Kosseir, on the Red Sea.

Caravan'sary, or CARAVANSERAI, the unfurnished inns of the East which from the earliest times have served as resting-places for caravans. They are usually built around a courtyard with a well, entered by a spacious gateway protected by strong doors and chains. Some are maintained by the government, others by private individuals or in connection with mosques. Some offer free accommodation and others make a small charge. At Cairo, Damascus, and other great caravan centres the caravansaries are large and handsome.

Caravel. See CARVEL.

Car'away (*Carum carvi*), an annual herb belonging to the order Umbelliferæ, about two feet high, with a much-branched stem, and umbels of white flowers in June. It is cultivated chiefly for its seeds, which are much used for flavoring. From the seeds, also, an oil is distilled which is used in medicine, as a stimulant and carminative. The caraway is easily grown in ordinary garden soil. Seed should be sown in autumn, about nine inches being ultimately allowed from plant to plant. The fruits will be ready for gathering at the end of the following summer.

Caraway

1. Flower. 2. Fruit. 3. Section of fruit.

Car'bides, compounds of carbon with other elements, principally metals. Though several carbides were long known to exist, our knowledge of these compounds was greatly extended by the researches of Moissan with the electric furnace, by which they are most conveniently prepared. Calcium carbide, CaC_2, is manufactured on a large scale by heating coke with lime in the electric furnace. It is a crystalline compound from which acetylene (C_2H_2, hydrogen carbide, and, theoretically at least, hydrocarbic acid) is obtained, for illuminating and heating purposes, by the action of water. Similar carbides are obtained from analogous metals, but these also yield other gases, as methane, ethylene, and hydrogen, as well as acetylene. Many carbides, particularly those of copper and silver, decompose with explosive violence when heated slightly. Iron forms a carbide of a different character, probably having the formula Fe_3C; this is one of the factors in the hardening of steel. Of the non-metals, silicon yields silicon carbide, or carborundum, SiC, prepared by heating coke and sand in the electric furnace (see CARBORUNDUM).

Carbineers. See CARABINIERS.

Carbohy'drates, a term applied to a large group of compounds containing carbon, hydrogen, and oxygen, the last two being in the proportion of two atoms of hydrogen to one of oxygen, as in water. They include (1) the *aldehyde - alcohols,* containing more or less than six carbon atoms, such as tetrose and arabinose; (2) *glucoses,* aldehyde or ketonic alcohols, containing six carbon atoms, such as dextrose or grape-sugar, lævulose or fruit-sugar, galactose, and sorbinose; (3) *saccharoses,* which are anhydrides formed by the union of two or more molecules of the glucose type, with loss of water, such as cane-sugar, maltose, milk-sugar, and raffinose; and (4) *amyloses,* of more complex constitution, such as starch, cellulose, dextrin, glycogen, and gums. Carbohydrates are important constituents of plant and animal life. They play an exceedingly important role in diet, two thirds of the energy produced in the living organism being due to their oxidation. See DIET AND DIETETICS; FOOD.

Carbol'ic Acid, PHENOL, or HYDROXY-BENZENE (C_6H_5OH), is a white crystalline solid derived from coal tar and largely used as a disinfectant and germicide, as a raw material in the manufacture of certain medicinal products, dyes and explosives, and as a constituent of synthetic plastics such as bakelite (q.v). Small traces of it occur in certain animal secretions. The tar obtained by the destructive distillation of wood contains appreciable quantities of phenol, but its principal commercial source is the tar distilled from bituminous coal. Synthetic phenol is manufactured in large quantities.

'Natural' phenol, so called to distinguish it from the synthetic product, is recovered from the middle or carbolic oil fraction from the distillation of coal tar. This oil, distilled according to American practice at between 170° and 240° C., and in Europe between 150° and 200° C., is chilled to remove naphthalene and mixed with a solution of caustic soda, which dissolves the phenol and related bodies and thus permits their separation from other constituents. Upon acidification of this watery solution the crude phenol is separated and distilled to purify it. A ton of average bituminous coal yields an average of ½ pound of phenol.

Phenol is synthesized in large quantities from benzene (q.v.) by two commercially practicable methods, among many theoretically possible ones. The more important of these consists in preparing sodium benzene sulphonate by treating benzene with strong sulphuric acid and neutralizing the sulphonic acid thus formed with soda ash, and fusing this salt with caustic soda to form sodium phenate, which yields phenol on acidification with carbonic or mineral acid. The chemical reactions involved are:

$C_6H_6+H_2SO_4=C_6H_5HSO_3+H_2O.$

$2C_6H_5HSO_3+Na_2CO_3=2C_6H_5NaSO_3+CO_2+H_2O.$

$C_6H_5NaSO_3+2NaOH=C_6H_5ONa+Na_2SO_3+H_2O.$

$2C_6H_5ONa+CO_2+H_2O=2C_6H_5OH+Na_2CO_3.$

Large quantities of phenol have been synthesized by treating mono-chloro-benzene (prepared by passing chlorine into benzene in the presence of aluminum chloride) with caustic soda, thus:

$C_6H_6+Cl_2=C_6H_5Cl+HCl.$

$C_6H_5Cl+NaOH=C_6H_5OH+NaCl.$

In addition to these two methods it has been proposed to manufacture phenol synthetically by the hydrolysis of chlorobenzene with steam ($C_6H_5Cl + HOH = C_6H_5OH + HCl$) and by the catalytic oxidation of benzene by air.

Phenol is a colorless solid, crystallizing in rhombic needles, and possessing a peculiar, characteristic, penetrating odor. Its melting point is 42.5°C., its boiling point 181–182° C., and its specific gravity, 1.09 at 0° C. Exposed to air and light it gradually assumes a deep red color, due presumably to oxidation, although no definite explanation has been found for this phenomenon. It is soluble in about fifteen parts of water at ordinary temperatures, but above 67.5° C. it is miscible with water in all proportions. A mixture of nine parts of phenol with one part of water is liquid at ordinary temperatures and is the form in which phenol is ordinarily dispensed by pharmacists. It is soluble in all proportions in all the customary organic solvents. Its characteristic odor and burning taste serve to distinguish it. It is an active corrosive poison and even in dilute solutions destroys micro-organisms.

Chemically, phenol is related to the alcohols and exhibits many of their properties. Its constitution is deduced from its synthesis from benzene, which consists essentially in substituting an hydroxyl group for one of its hydrogen atoms. It may also be produced by the careful oxidation of benzene with hydrogen peroxide or nascent ozone, thus showing that it is an oxidation product of the benzene hydrocarbon. With caustic alkalies it forms phenylates (carbolates, phenolates, or phenoxides) corresponding to the alcoholates, and it is on the basis of these quasi salts, as well as its corrosive action on the skin, that phenol has been called carbolic acid, although strictly speaking it is not an acid. The phenylates are reconverted to phenol by the action of even so weak an acid as carbon dioxide. The introduction of the hydroxyl group into the benzene ring greatly increases its chemical reactivity, and phenol readily forms a variety of substitution products which are prepared only with difficulty from benzene.

A standard test for phenol is the precipitation of insoluble tribromo-phenol when bromine water is added to an aqueous solution of phenol. Ferric chloride produces a characteristic violet color when added to an aqueous phenol solution.

Many of its derivatives, as well as phenol itself, have germicidal and other valuable medicinal properties. Salicylic acid and the salicylates (qq.v.) are important medicinally. The amino phenols and their derivatives are important in photography and dyeing. Trinitrophenol (picric acid) is used both in dyeing and as a high explosive (see LYDDITE) similar in many respects to trinitrotoluene. The largest use of phenol at the present time is in the manufacture of synthetic resins by condensation with aldehydes. These resins are particularly important as the basis for insulating material used in electrical and radio apparatus.

Phenol was formerly largely employed in aqueous solution as a disinfectant in surgical dressings, but, on account of the possibility of serious burns and poisoning if it be improperly used, other germicides have taken its place to a considerable extent. It was one of the first antiseptics used by Lister and is still considered the standard by which others are measured for germicidal power. Thus, other disinfectants are rated as having a 'phenol coefficient' of, say, 8, which means that a concentration of phenol in solution eight times that of the substance in question is required to be equally effective in killing bacteria (usually *B. aureus pyogenes* is taken as the standard bacterium).

For medicinal purposes phenol is used in glycerin, in a suppository and an ointment, also in watery mixture and oily solution as an external antiseptic, and internally in small doses (one to three grains) for antisepsis of the alimentary tract. Externally applied in a strong solution, such as one to ten, it acts as an irritant to the unbroken skin, producing a burning sensation, which, however, soon disappears, leaving a white, hardened surface, the burning being followed by temporary anæsthesia. In strong solution carbolic acid penetrates the unbroken skin, and produces carbolic acid poisoning in proportion to the amount absorbed. In the case of children its external application has been followed by albuminuria, and if absorbed, that part of it which leaves the body through the kidneys stains the urine a characteristic olive-green or gray. Internally, in small doses taken by the mouth, it stops fermentative changes in the stomach. For this purpose it is generally given as a sulphocarbolate (phenol sulphonate).

Carbolic Acid Poisoning.—A strong solution or pure carbolic acid taken in at the mouth acts at once on the mouth, throat, and stomach as a caustic poison. It enters the circulation and acts on the brain as a narcotic, the patient becoming comatose, cold, and cyanotic. The immediate danger is that of death through dyspnœa; but if the patient recovers from the first effects, there is still danger of suffocation owing to subsequent swelling of the injured air-passages.

The first thing, in treating poisoning by carbolic acid, is to rid the stomach of what has not already been absorbed. The stomach-pump is not safe, because of the probable condition of the mucous membrane; but the soft siphon tube should be used, and the stomach washed out until there is no smell of carbolic acid in the washings. Sodium, magnesium, or other soluble sulphate (half an ounce to a pint of warm water) may be given, or a dram of saccharated solution of lime in a pint of water. After this olive oil (a quarter of a pint in a pint of warm water) may be given, or white of eggs in water, or large quantities of milk, keeping up the warmth of the body, and using alcoholic stimulants if necessary. It has been suggested that the soluble sulphates act by forming sulphocarbolates. After the first dangers of collapse and dyspnœa have been overcome, great care must still be taken in feeding that the throat and œsophagus do not suffer from irritation by solid food.

Car'bon (C, 12) is an element widely distributed in nature—being found free as diamond and graphite, and in an impure state as coal; in combination it occurs in carbon dioxide, in all carbonates, as limestone and dolomite, and as an essential constituent of all living things. More than 200,000 different compounds of carbon are known, far more than of any other element. Originally it was believed that compounds of carbon could be produced only by the intervention of living matter, so closely were they bound up with the life process. For this reason the chemistry of carbon compounds was designated 'organic chemistry,' a term which persists today as a convenient classification in spite of the fact that tens of thousands of carbon compounds have been artificially produced in the laboratory.

The three naturally occurring varieties of carbon are of considerable value industrially, but a number of other varieties are also commercially useful. If material containing carbon be burned in a sufficient amount of air, the final form of the carbon is carbon dioxide (see below); if less air be admitted, carbon monoxide is formed; if still less air be present, it is easily possible to burn away the other elements having volatile oxides and leave a part of the carbon in a comparatively pure form. In this way charcoal and coke are made in large quantities from wood and soft coal, and lamp black and gas black from petroleum and natural gas. Charring of bones and ivory in a similar manner yields bone black and ivory black, both impure forms of carbon. Improved methods of manufacture of both charcoal and coke (destructive distillation) are largely practised to-day, in which the wood or coal is heated out of contact with air and valuable by-products recovered (gas, pyroligneous acid and tar from wood, and gas, naphtha, ammonia and tar from coal). Except coke, these prepared carbons have valuable absorbent and decolorizing properties, which can be considerably increased by special methods of preparation (activated carbon).

Carbon, like several other of the elements, exists in allotropic forms—*i.e.*, in varieties which, although they have totally different properties, consist of carbon and nothing else. This is proved by the fact that not only can one form be changed into another, but also that all the kinds burn in oxygen, and from equal weights yield the same weight of carbon dioxide — $C + O_2 = CO_2$. All the forms are solid, and volatilize without melting at the temperature of the electric arc. It is theoretically possible to melt carbon without volatilization, under pressure at high temperatures, although this has not been accomplished commercially. The various forms are insoluble in any ordinary solvent, but dissolve in melted metals, such as iron, from which they crystallize, on cooling, in the form of graphite. If the cooling is made to take place under very great pressure, some of the carbon is obtained in the form of minute diamonds. Diamonds may have been produced in a somewhat similar way in nature, as they show signs of having been subjected to great pressure during formation.

The diamond is an exceedingly hard, somewhat brittle solid, colorless, transparent, and highly refractive when pure, and crystallizing in regular octahedra (sp. gr. 3.5). Unlike other varieties of carbon, it is a non-conductor of electricity, and is converted into graphite when strongly heated, in the absence of air. Its chief industrial use depends upon the fact that it is the hardest known substance. Diamond dust is used as an abrasive and 'carbonadoes' (black or discolored diamonds) to form cutting edges for drills and for glass cutters. (See Diamond).

Graphite (black lead or plumbago), besides occurring naturally, is prepared by heating anthracite coal in the electric furnace. It is a soft, greasy-looking, black solid (sp. gr. 2.25) that crystallizes in six-sided plates. Its chief use is in lubricants, in contact brushes for electrical machinery, as a constituent of some metal paints formerly supposed to possess anti-corrosive properties, as the 'lead' in pencils, and as the electrodes used as conductors in certain electro-chemical and electro-metallurgical processes. (See Black Lead).

The other varieties of carbon are amorphous—*i.e.*, without crystalline form—depending for their appearance on the way in which they are prepared. Thus, charcoal is soft, black, and porous, resembling the wood from which it is obtained. It has great power of absorbing air and other gases, which become peculiarly active while in its pores. For this reason charcoal is used as a deodorant, and animal charcoal (obtained by charring bones) for decolorizing oils, juice of the sugar-cane, alkaloids, etc. Amorphous carbons prepared from gas and oil are used in rubber manufacture and as pigments in black paints and printing ink. Coke and charcoal are largely used as fuel in the recovery of iron and other metals from their ores and to some extent as smokeless domestic fuels.

Chemically, carbon is unique in forming an almost infinite series of compounds—a fact that is due to its nearly unlimited power of uniting atom to atom to form open or closed chains, other elements being attached throughout the length of the chain.

Carbon dioxide (CO_2), also known as carbonic acid gas, is a compound of carbon and oxygen, in the proportion of twelve parts of the former to thirty-two of the latter. It occurs in the air and in natural waters, some of the latter being highly charged with it. It is formed when any material containing carbon is burned, and being produced by the oxidation of food-stuffs, is also expired by animals. Many carbonates are decomposed by heat, yielding an oxide of the metal and carbon dioxide, *e.g.*, the burning of limestone to quicklime. Similarly, the treatment of carbonates with acids yields a salt of the acid and carbonic acid, which readily decomposes into water and carbon dioxide. Commercially it is prepared in huge quantities, for carbonating beverages, by the burning of coke, and as a by-product in the manufacture of epsom salt by treating dolomite with sulphuric acid. It is interesting to note that the energy liberated by the burning of coke is sufficient to compress the carbon dioxide formed to a liquid, the form in which it is marketed. Large quantities of carbon dioxide are evolved in the fermentation of sugar to alcohol, an important commercial source.

Carbon dioxide is a colorless, odorless gas, a little more than one and one half times as heavy as air. It can be liquefied under pressure at any temperature below 31° c. Liquid carbon dioxide has a specific gravity of 0.83 and a boiling point of −78.2° c. If allowed to boil by the release of pressure, liquid carbon dioxide is converted into a white, snow-like solid, by the cooling effect of its evaporation. Carbon dioxide is soluble in water, forming a faintly acid solution, presumably containing carbonic acid (although this has never been isolated) from which the whole series of carbonates may be considered to be derived. It does not burn in air nor does it support combustion except of such metals as magnesium, potassium, etc., which form their own oxides and liberate carbon. It is a passive poison to animal life, acting to dilute the oxygen of the air, and is dangerous only when the oxygen content of air has been sacrificed by burning carbonaceous material in it, thus replacing the oxygen by carbon dioxide. It is the essential food of growing plants, which by a process of photosynthesis convert carbon dioxide and water into starches, sugars, and cellulose. The presence of carbon dioxide is detected by its inability to support combustion and by its formation of the insoluble carbonate when passed into lime water.

Commercially, great quantities of carbon dioxide are used in the beverage industries to impart flavor to vichy water and other soft drinks. For this purpose it is transported in a liquid state in strong steel cylinders from which it is released to be dissolved in water under pressure. Beer and sparkling wines contain carbon dioxide in solution. It is formed in the operation of most portable fire extinguishers by the action of sulphuric acid on sodium bicarbonate solution. The use of solid carbon dioxide as a commercial refrigerant has been demonstrated to be economical and is rapidly increasing.

Carbon monoxide has the formula CO, indicating that it is composed of twelve parts by weight of carbon to sixteen of oxygen. It is not ordinarily present in nature, and is formed by the combustion of an excess of carbon in oxygen; carbon dioxide being probably first formed, and then reduced to carbon monoxide, $C + O_2 = CO_2$, and $CO_2 + C = 2CO$. If required pure, it is best prepared in the laboratory by warming formic acid or a formate with concentrated sulphuric acid—$HCOOH + H_2SO_4 = CO + H_2SO_4 + H_2O$.

Carbon monoxide is a colorless, odorless gas, that liquefies at −190° c., and is almost insoluble in water. It burns in air with a blue flame (often seen on the top of a clear fire), forming carbon dioxide with the oxygen. The mixture of it with air or oxygen is explosive—$2CO + O_2 = 2CO_2$. It is exceedingly poisonous, the inhalation of a single litre being sufficient to cause death—the carbon monoxide combining with the red coloring matter of the blood, and preventing it from carrying the necessary oxygen to the tissues. Breathing pure oxygen is the best antidote.

Technically, carbon monoxide is extensively used as a fuel. It is present in ordinary coal gas, and is largely prepared mixed with nitrogen, under the name of 'producer gas' by drawing air through heated coal, and as 'water gas' by blowing steam through red-hot coke, when a mixture with hydrogen in equal volumes is obtained—$C+H_2O=CO+H_2$. 'Mond' and 'Dowson' gases are similar to these. Producer gas is used for furnace-heating and for gas-engines; water gas being also employed for lighting, after admixture with sufficient oil vapors to give it luminosity.

In recent years carbon monoxide is finding extensive use as a raw material for the manufacture of certain organic compounds. A mixture of carbon monoxide and hydrogen (such as is produced by passing steam over very hot carbon, as in the manufacture of water gas, with the addition of further quantities of hydrogen) is passed at high temperatures and pressures over a catalyst for the production of methanol (wood alcohol) in commercial quantities. The catalyst used may be zinc oxide containing traces of copper or cerium aluminate containing nickel. If other catalysts be used, other compounds of hydrogen and carbon with varying amounts of oxygen may be prepared. A synthetic fuel for internal combustion engines, sold under the trade name 'synthol,' is made in large quantities by this method in Germany.

Carbon disulphide, or carbon bisulphide (CS_2), is a compound of twelve parts of carbon to sixty-four of sulphur. It does not occur naturally, but is prepared by passing the vapors of sulphur over strongly heated coke or charcoal—$C + S_2 = CS_2$. The sulphur is melted, and flows to the bottom of a vertical cast-iron or clay retort, which is heated by an external fire, or internally by electric arcs or resistances. As a result the sulphur is vaporized and combines with the hot carbon, the carbon disulphide formed being led off through cooled pipes and condensed. It is afterwards purified by distillation. Carbon disulphide is a highly refractive, colorless liquid, somewhat heavier than water, with a not unpleasant odor resembling chloroform. Usually, however, the liquid smells badly from the presence of impurities which form upon keeping it. Carbon disulphide has a specific gravity of 1.292 at 0° C., boils at 46° C., and readily evaporates to a heavy vapor. It is only slightly soluble in water, but is itself an excellent solvent for oils, fats, gutta-percha, etc. It burns with a pale blue flame, forming carbon dioxide and sulphur dioxide if there is excess of air, $CS_2 + 3O_2 = CO_2 + 2SO_2$; though with a limited access of air sulphur is also set free. In oxygen or nitric oxide the vapor burns brilliantly, the combustion being explosive if the vapor is previously mixed with air or oxygen. Though neutral to litmus, carbon disulphide exhibits some acidic properties, uniting with alkaline sulphides to form thiocarbonates. Its vapor is very poisonous when breathed.

Technically, carbon disulphide is used to dissolve oils, fats, waxes, resins, etc., and as a solvent for sulphur chloride in vulcanizing rubber. It is employed as an insecticide, particularly for killing weevils in grain, but must be used with great caution. It is also used to destroy rats and other small burrowing animals in their holes.

Carbon tetrachloride (CCl_4), or tetrachloromethane, is prepared by the action of chlorine on carbon disulphide. It is a colorless liquid of specific gravity 1.582 (21° C.), boiling at 77° C. Because of its non-inflammability and great solvent powers, it is used as a cleansing agent, either alone or mixed (60 pts. to 40) with gasoline, which mixture is also non-inflammable. It is also used in large quantities in the extraction of oils from seeds, as a solvent for rubber and other gums, and to an even greater extent as a fire extinguisher under the trade name, 'pyrene.' Its vapors, when concentrated, cause considerable discomfort—if not actual harm—to human beings, and for this reason it is not recommended for use in fires where subsequent ventilation is difficult.

See also CHEMISTRY; CARBIDES; CARBONATES; HYDROCARBONS.

Carbonari, kär-bō-nä'rē, an Italian secret political society formed early in the 19th century to resist the misgovernment of the Bourbon princes in Naples and to secure Italian freedom and unity. It has statutes and a ritual similar to those of the Freemasons. Spreading throughout Italy, it prepared the revolutions of 1820–21 in Naples and Piedmont, but collapsed before the Austrian troops. It was superseded by Mazzini's 'Young Italy' Society, though as late as 1867 there were a few Carbonari lodges in existence. Carbonarism was also well organized in France, but after the July revolution it gradually ceased to exert any influence.

Carbonated Waters (Soda Water, Vichy, Seltzer, Aerated Water), a term applied to a large class of beverages which are rendered sparkling and effervescent by dissolving carbon dioxide in them under pressure. The release of the pressure permits evolution of the dissolved gas, thus causing effervescence. The carbon dioxide also improves the flavor of the beverage.

Carbon dioxide for use in beverages is obtained from three commercial sources, in the following order of importance: (1) the burning of coke in the air; (2) the fermentation of sugar into alcohol by yeasts; (3) as a by-product from certain industrial operations involving the treatment of a carbonate by an acid. It is then purified and liquefied under pressure, finding its way into commerce in heavy steel cylinders. This liquid carbon dioxide is dissolved in water in strong, tin-lined steel containers, under pressures as high as 100 pounds per square inch, at which pressure water dissolves seven times its own volume of gas. The carbonated water may be bottled in strong bottles, called siphons, from which any part of it can be withdrawn at will, or may be made up into beverages by the addition of sweetened syrups and then bottled under pressure. During 1923 more than 50 million pounds of carbon dioxide was produced in the United States and used in the manufacture of beverages.

Many mineral waters (q.v.) are naturally carbonated and others, artificially prepared, are carbonated to add 'life' to the otherwise flat taste imparted by their saline constituents.

Car'bonates, the salts derived from the hypothetical dibasic carbonic acid, H_2CO_3; they are of three varieties—*normal, acid,* and *basic*—all of which are decomposed by most dilute acids with the evolution of carbon dioxide. The *normal carbonates,* in which both hydrogen atoms of carbonic acid have been replaced by a metal, are, as a rule, crystalline solids, and, with the exception of those of the alkali metals, are insoluble in water and are decomposed into oxides and carbon dioxide when strongly heated. Calcium carbonate (calcspar, limestone) and sodium carbonate (washing soda) are typical examples. The *acid carbonates* or *bicarbonates,* in which only one hydrogen atom is replaced, are less known. They are decomposed with evolution of carbon dioxide on heating to the temperature of boiling water. Sodium bicarbonate is an example of this class, and is used in baking powder, seidlitz powders, etc., from the ease with which carbon dioxide is set free from it. The *basic* carbonates, which may be looked on as formed by the incomplete neutralization of the base by carbonic acid, are complex, and have been but little investigated; white lead, $Pb(OH)_2 2PbCO_3$, may be taken as typical.

Car'bondale, city, Illinois, county seat of Jackson county, on the Illinois Central Railroad and a local electric line; 8 miles southwest of Murphysboro. The Southern Illinois Teachers' College is situated here. The city is an important shipping point for grain, coal, vegetables, and fruit and has a large railroad tie preserving plant, a garment factory, and coal mines. Commission government was adopted in 1910. Pop. (1910) 5,411; (1920) 6,247.

Carbondale, city, Pennsylvania, Lackawanna county, on the Lackawanna River, and on the Delaware and Hudson, the Erie, and the New York, Ontario and Western Railroads; 12 miles northeast of Scranton. It is surrounded by picturesque mountain scenery, and has a public library, parks, hospital, and Federal building. Industries include coal mining, the manufacture of paint, silk, and chemicals, bottling works, car and machine shops, and foundries. According to the Federal Census for 1919, industrial establishments number 43, with $3,439,717 capital, and products valued at $3,187,996. The district contains some of the oldest mines and most extensive deposits of anthracite in the country. The city has commission government. Pop. (1900) 13,536; (1910) 17,040; (1920) 18,640.

Carbone, kär-bō'nā, TITO (1863–1904), professor of pathology and anatomy in the University of Modena, acquired celebrity by his work confirming the causative organism of Mediterranean or Malta fever (*Micrococcus melitensis Bruce*). In the course of his studies he acquired the infection and died from the fever. During his illness he wrote a complete monograph, noting the progress of the disease and his observations upon it.

Carbonic Acid Gas. See CARBON (subhead *Carbon Dioxide*).

Carbon Hill, city, Alabama, Walker county, on the St. Louis-San Francisco Railroad; 60 miles northwest of Birmingham. Pop. (1910) 1,627; (1920) 2,666.

Car'bonif'erous, one of the great periods or divisions of the Paleozoic Era in geology. From the Carboniferous system the world derives its principal supplies of coal, though that commodity is by no means confined to this series of rocks. Extensive supplies of ironstone, metallic minerals, fireclay, building stone, and other valuable materials are also drawn from this formation.

The Carboniferous system overlies the Devonian and is succeeded or completed by the Permian. It falls naturally into two great subdivisions—a lower, known as the Mississippian, including great thickness of limestones, shales and sandstones, but poor in workable coal; and an upper series, known as the Pennsylvanian, and containing many valuable seams of coal. The Carboniferous series of rocks is highly developed in the Pennsylvania region, the central Mississippi Valley, and in certain districts of the Rocky Mountain region. These areas are very different in many characters, but all are capable of subdivision into an upper and a lower group as indicated above. The chief eastern formations represented in the Carboniferous are as follows:

Upper or Pennsylvanian,	Upper Productive Coal Measures. Lower Barren Stage. Lower Productive Measures. Millstone Grit.
Lower or Mississippian,	Mauch Chunk Shales. Pocono Sandstone.

In the Mississippi Valley the Lower series includes the Chester, St. Louis, Osage and Kinderhook stages, represented by great development of limestones up to 15,000 feet in thickness. The Carboniferous in the United States covers over 200,000 square miles and is extremely rich in coal in both the eastern and Mississippi Valley regions. In England there is only fresh-water Upper Carboniferous, but a similar succession and subdivision holds. The rocks of this period are heavily developed in the north of England. In France, Spain, and Belgium there is a similar succession. In Russia the Upper Carboniferous consists mainly of limestones (Fusulina limestone); and in Spain, Asia, and North America marine limestones are present in the Upper Carboniferous.

The Lower Carboniferous rocks are mostly sandstone, limestone, and shale; the Upper are sandstones, black shales, fireclays, coals, and ironstones. In the Appalachian region they have in part been folded into anticlines and synclines or troughs, bordered on the west by flat strata. The Mississippi Valley strata are almost horizontal. In the Alps, the Appalachians, and in Belgium the Carboniferous has been in places greatly broken, disturbed, and plicated, and may have, as the result of these movements, taken on many of the characters of the older crystalline schists.

In the southern hemisphere a very different facies prevails in the Carboniferous. The Lower Carboniferous of Australia contains the same genera of fossils as the English Carboniferous; but the Upper or Permo-Carboniferous strata, which include many seams of coal, are distinguished by the presence of a flora, of which the most prominent member is the fern Glossopteris. This glossopteris flora occurs also in India and South Africa, and the beds which contain it are relegated to a later period than the American or English Coal Measures. In this series of rock certain conglomerates are found which have occasioned much discussion. They are full of large striated blocks, and are believed by most geologists to be of glacial origin (Talcher conglomerate of India, Dwyka conglomerate of South Africa). With this exception, all evidence points to the climate of Carboniferous times having been moist, warm, and equable. The abundance of ferns, in particular, is very suggestive.

In plants the Carboniferous is exceedingly rich: they are mostly ferns, conifers, lycopods, and Equisetaceæ. Owing to the fortunate preservation of petrified stems, even the minute anatomy of these is very well known. The highest animals were reptiles and giant amphibians (Labyrinthodonts). Fishes abounded, principally ganoids and sharks; and in the limestones all kinds of marine life are abundantly represented—corals, crinoids, blastoids, brachiopods, molluscs, worms, Polyzoa and Foraminifera being the most common. The life of no other paleozoic period is so well known. See COAL, *Geology*.

Carbon Monoxide, or CARBONIC OXIDE. See CARBON.

Carbon Print. See PHOTOGRAPHY.

Carbonyl Dichloride. See PHOSGENE GAS.

Carbon Paper, tissue paper chemically treated so as to produce copies of an original manuscript. The paper is first made as absorbent as possible by removing all oil and impurities from the fabric and is then coated with a specially prepared ink, which is essentially a mixture of wax, color, and oil.

Car'borun'dum, a carbide of silicon, SiC, prepared by heating sand with coke in an electric furnace. A little salt and some sawdust are usually added to the mixture to facilitate the operation of the furnace. Carborundum is a crystalline solid (sp. gr. 3.123), colorless when pure, but commercially brown or black, from the presence of impurities.

It is extremely hard and is used for abrasive purposes, making an excellent substitute for emery or corundum. Carborundum was first made in 1881, by Edward G. Acheson (q. v.). It is manufactured on a large scale at Niagara Falls.

Carboxyl. See ACIDS.

Car'buncle, a name given to almandine or crimson garnet, when cut *en cabochon—i.e.* with a rounded, smooth surface without facets. See GARNET.

Carbuncle, a circumscribed gangrenous inflammation of skin and subcutaneous tissue, similar to a very large boil, but far more serious because of its size. Unna thinks that it is caused by a special organism, while others say that it is due to *Staphylococcus pyogenes*, sometimes combined with *Streptococci*. A carbuncle begins with a circumscribed induration of skin and subcutaneous tissues, generally on the back of the neck, the shoulders, head, or abdomen; rarely on a limb. The hard area reddens, and then becomes purple; there is severe localized pain, throbbing, and tenderness. There may also be a rise of temperature. Later the hardness gives place to a soft, or 'boggy' feeling to the touch; the skin breaks in several spots, and oozes. Discharges may continue for a long time through several separate openings, or they may run together, the skin may come away, and a gray mass of dead tissue be exposed. The carbuncle may spread at the edges until the sufferer is exhausted, or septicæmia may occur at any time, causing death by self-poisoning.

The *treatment* of carbuncle is usually surgical; sometimes the development of the lesion can be aborted by early application of a 5 to 10 per cent. carbolic acid solution or 50 per cent. ichthyol solution. Vaccine treatment has given good results in some cases. Tonics such as strychnine, iron and arsenic are indicated to maintain the patient's strength.

Car'bure'ter, the apparatus in motor-car and oil engines in which oil is converted into gas, and by the admission of a regulated supply of air becomes an explosive mixture. The term is also used to denote the fire-brick-lined steel cylinder in which water gas is enriched with oil to make it luminous when burnt. The oil is sprayed in at the top of the cylinder and is 'cracked' or volatilized by the heat of the water gas and the heat remaining from the preceding 'blast' in the fire-brick lining and checkerwork in the cylinder. See GAS MANUFACTURE; OIL AND GASOLINE ENGINES; MOTOR CARS.

Carcagente, kär'-kä-hän'tā, or CARCAJENTE, town, Spain, in the province of Valencia, near the river Jucar; 25 miles southwest of Valencia. It has large mulberry and orange groves. Pop. (1910) 13,520.

Carcajou, kär'ka-jōō, the French-Canadian name of the wolverine (see GLUTTON), derived from an Indian name for the animal; sometimes improperly applied to the puma.

Carcano, kär-kä'nō, GUILIO (1812–84), Italian poet and novelist, was born in Milan. In 1839 he published *Angiola Maria*, which marks the beginning of the domestic novel in Italian literature, just as Manzoni's *I Promessi Sposi* marks that of the historical novel. In 1859 he became professor in the Academy of Milan, and was afterwards nominated senator. Among his numerous works are the novels *Racconti Semplici* (1843), *Damiano* (1851), *Dodici Novelle* (1853); the collections of *Poesie edite ed inedite* (2 vols. 1861–70) and *Poesie varie* (1875); and the tragedies *Spartaco* (1857), *Ardoino* (1860), and *Valentina* (1870). One of his principal achievements was an Italian translation of Shakespeare.

Carcar, kär'kär, pueblo, Cebu, Philippine Islands, on the east coast road at the head of Carcar Bay; 23 miles southwest of Cebu. An active coast trade is carried on. Pop. (1918) 37,392.

Carcassonne, kär-ka-sŭn', town, France, capital of the department of Aude, 55 miles southeast of Toulouse. It consists of two parts—the modern lower town, well built and prosperous, on the left bank of the Aude; and the old upper town, on the hill opposite. The old town is notable as offering a remarkably fine example of military architecture of the 11th to the 13th century. It has a double enceinte, about one mile in length, with 54 towers, and two gateways and the citadel. In the lower town is the Gothic church of St. Vincent; the cathedral of St. Michel (13th century), and a museum. Paper, cloth, soap, leather, linen, wine, and pottery are manufactured. Carcassonne dates from the time of Cæsar, and was the scene of the massacre of the Albigenses by Simon de Montfort in 1210. The Black Prince burned the town in 1355. Pop. (1921) 29,314.

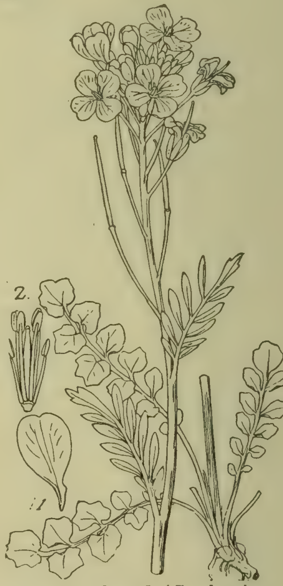
Car'cel Unit, the flame standard officially adopted in France for gas testing; it is equal to 9.615 international candles.

Carchemish, kär'ke-mish, a town of the Hittites (2 Chron. xxxv. 20), at the ferry between Haran and Syria. It is identified with the ruin Jerablus, in the north of Syria, on the west bank of the Euphrates.

Carcinoma. See CANCER.

Cardale, JOHN BATE (1802–77), one of the founders (1835) and the first apostle of the Catholic Apostolic Church. In 1842 he compiled the liturgy then adopted, and wrote several religious works of a doctrinal and practical character, including *A Manual or Summary of Special Objects of Faith and Hope* (1843), and *The Confession of the Church* (1848).

Car'damine, a genus of the mustard family. Most species grow along watercourses and in wet places, but a few, like the Alpine bittercress (*C. bellidifolia*), are found on rocks and mountain summits. The flowers are cruciform, and are succeeded by pods which are straight and linear, with valves which, when the pod is ripe, curl up and separate with a spring, so that the seed is scattered to a considerable distance. The most interesting is the 'Cuckoo Flower,' or 'Lady's Smock' of both the Old and New World. Its broad lilac, or creamy white petals, borne in short racemes high above the pinnate foliage, are conspicuous in swamps. An Old World salad plant is *C. hirsuta*, the Bitter-Cress. *C. bulbosa*, also white-flowered, is among the first to bloom.



Lady's Smock (Cardamine pratensis)

1. Petal. 2. Pistil and stamens.

Car'damom, the dried capsule of a herbaceous plant known as *Elettaria cardamomum*, a native of the coast of Malabar, India, where it is found growing in clearings in forests and is also cultivated. It reaches a height of about eight feet, and bears drooping scapes of flowers. The triangular capsules are gathered in the late autumn and dried in the sun. Cardamom is used in medicine as a carminative. In Europe and Asia, the cardamom is employed as a condiment in cookery.

Cardamom Hills, range of hills (alt. 2,000–4,000 ft.) in Travancore state, Madras, India, so-called because of the large quantity of cardamoms cultivated and gathered there.

Cardanus, kär-dā'nus, or CARDAN (1501–76), an Italian philosopher, mathematician, and astrologer, whose right name was GERONIMO CARDANO, was born in Pavia. He was educated at the University in his native city and taught mathematics and medicine in Milan (1534), Pavia (1547), Bologna (1562–70), and Rome (1571). During these years of teaching he was also engaged in writing, his chief works being a remarkable autobiography, *De Vita Propria* (1571–5); the *Ars Magna* (1545), which contains a formula for the solution of certain kinds of cubic equations known as Cardan's formula, although it was really the work of Tartaglia; *Practica Arithmeticæ Universalis* (1539); and *De Subtilitate Rerum* (1550). In spite of extravagant pretensions and superstitions, Cardan was a man of great learning and astuteness.

Cardboard. See PASTEBOARD.

Cardenal, kär-d'nal', PEIRE (d. 1306), Provençal troubadour, was born in Puyen-Velay, and flourished about the beginning of the 13th century. His songs, some seventy of which have come down to us, are, for the most part, *sirventes*, dealing with the corrupt manners of the clergy and nobles. At its best his poetry is characterized by vigor and passion. His songs have been printed by Mahn in his *Gedichte der Troubadours* (1856–73).

Cardenas, kär'dā-näs, seaport, Cuba, in the province of Matanzas, on the northern coast; 76 miles east of Havana, with which it has rail connection. It is a flourishing modern city celebrated for two underground rivers which furnish the water supply. There is a fine cathedral and the central square contains a statue of Columbus presented by Queen Isabella II. Cardenas is an important port for the shipment of sugar and tobacco, and there are submarine deposits of asphalt in the harbor. In Cardenas harbor occurred the battle of the Spanish-American War in which Ensign Bagley, the first American officer to lose his life, was killed. Pop. (1919) 32,753.

Cardia, the esophageal orifice of the stomach (q. v.).

Cardialgia (Gr. 'heart-pain'). See HEARTBURN.

Car'diff, port and largest city in Wales, capital of Glamorganshire, is situated on the Taff River, 2 miles from its mouth. The city is well built and attractive with several fine parks, chief among which are Cathays Park, Roath Park, Cardiff Arms Park, Sophia Gardens, and Victoria Park with zoölogical gardens. Notable buildings are Cardiff Castle, built about 1090, now the property of the Marquis of Bute; the group of public buildings in Cathays Park, including the law courts, city hall, and county hall; the Central Public Library; the University College of South Wales; the Welsh National Museum; and St. John's Church. Cardiff owes its prosperity chiefly to its splendid docks, consisting of five great basins with more than five miles of quays. It is the greatest coal exporting port in the world. It has enormous iron and steel works, paper and chemical manufactures, and shipbuilding yards. Since 1916 it has been the seat of a Roman Catholic archbishop. Pop. (1921) 200,262.

Car'digan, town and seaport, Wales, capital of Cardiganshire, on the right bank of the Teifi; about 75 miles northwest of Cardiff. The parish church and the priory near by are interesting buildings and about a mile distant from the town is St. Dogmael's Abbey, now partly in ruins. The castle, built in the time of Henry II., is also in ruins. Tile and brick making are the leading industries. Pop. (1921) 3,452.

Cardigan, JAMES THOMAS BRUDENELL, SEVENTH EARL OF (1797–1868), was born at Hambledon, Hampshire. In the Crimea he led the Light Brigade at Balaklava (1854).

Cardigan Bay, a large bay on the west coast of Wales, extending from Braich-y-pwll to St. David's Head and having a coast line of about 130 miles.

Car'diganshire, maritime county on the western coast of Wales, with an area of 443,189 acres. The surface is mountainous in the north and centre, and undulating in the south. Many small lakes are scattered over the surface, especially in the northern section. The soil is varied—fertile in the lower valleys and along the coast, poor in the mountains. The chief industry is sheep and cattle raising. Lead and zinc are obtained to a limited extent; gloves, flannel, and hats are manufactured.

Cardiganshire is rich in antiquities, including ancient British fortifications, stone circles, cromlechs, and inscribed stones. There are also remains of several mediæval castles (Aberystwith, Cardigan, etc.) and monastic buildings (Strata Florida), besides interesting examples of ecclesiastical architecture. Pop. (1921) 61,292.

Cardin, town, Oklahoma, Ottawa county, on the Miami Mineral Belt Railroad; 3 miles from the Kansas, and 12 miles from the Missouri State line. Pop. (1920) 2,640.

Cardinal, one of the body of senators of the Church of Rome who act as the Pope's counsellors, constitute the Sacred College, and, in dignity and influence, are second only to the Pontiff himself. Its members are appointed by the Pope; at his death, assembled in conclave, they elect his successor, usually from among their own number, and during the period intervening one of them administers the affairs of the church (see CAMERLENGO).

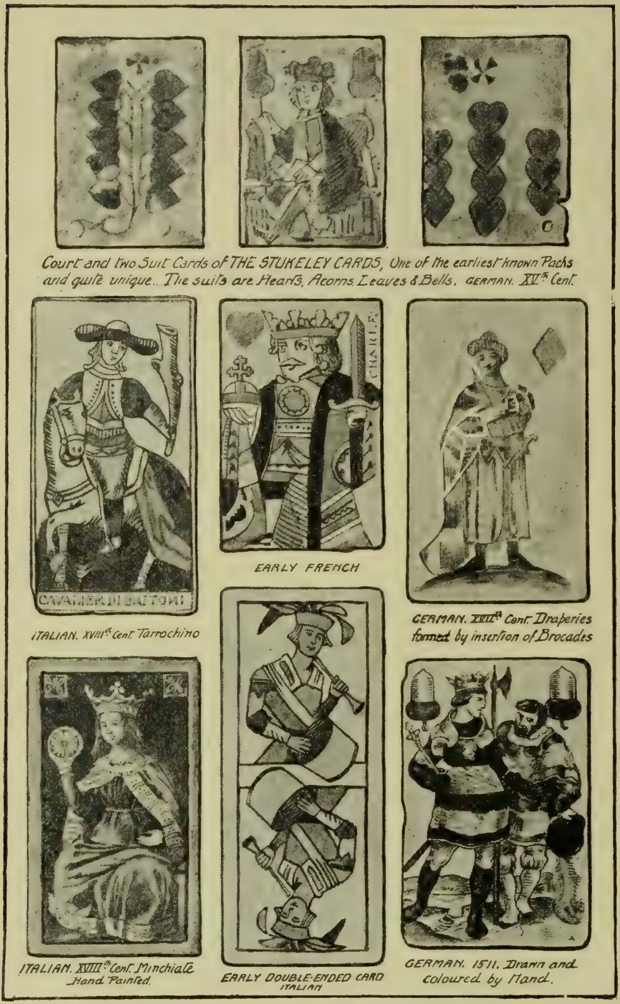
The number of cardinals is not allowed to exceed seventy, of which not more than six are called 'bishops' and occupy the suburban sees of Rome, while of those described as 'priests' the maximum number is fifty, and of 'deacons' fourteen. The cardinal bishops and most of the cardinal deacons live at Rome, but only a few of the cardinal priests. In the early centuries of Christianity their number was smaller, and they took no exclusive part in the papal election till 1179 A.D. For matters of detail the Sacred College divides itself into 'congregations,' which meet separately for deliberation and decision, with the papal approval, on all the multifold affairs of the church.

There is but one episcopal seat whose occupant becomes a cardinal by virtue of his office—the patriarchate of Lisbon. It is customary, however, for the following dignitaries to be made cardinals upon giving up their offices: the Nonces of Paris, Vienna, Madrid and Lisbon, the Assessor of the Congregation of the Holy Office, the secretaries of the Sacred College, of the Congregation of the Council and of the Congregation of the Bishops and Regulars, the Major Domo, the Vice-Camerlengo, the Auditor, and the Treasurer of the Apostolic Chambers.

Cardinals wear a red dress and red cap, and have also a red cardinal's hat, which they must receive in Rome from the hands of the Pope. This hat is never worn after the Consistory at which it is bestowed.

The first American cardinal was John McCloskey, archbishop of New York, created in 1875. At present (1924) there are four American cardinals: O'Connell of Boston; Dougherty of Philadelphia; Hayes of New York; and Mundelein of Chicago, the last two appointed in 1924.

Cardinal Bird, RED BIRD, or VIRGINIAN NIGHTINGALE (*Car-*


Court and two Suit Cards of THE STUKELEY CARDS, One of the earliest known Packs and quite unique.. The suits are Hearts, Acorns, Leaves & Bells. GERMAN. XVth Cent.
CAVALIER DI BASTONI
ITALIAN. XVIIIth Cent. Tarrochino
CHARLE
EARLY FRENCH
GERMAN. XVIIth Cent. Draperies formed by insertion of Brocades
ITALIAN. XVIIIth Cent. Minchiate Hand Painted.
EARLY DOUBLE-ENDED CARD ITALIAN
GERMAN. 1511. Drawn and coloured by Hand.

Playing Cards: Early Colored Specimens

dinalis virginianus), a handsome North American grosbeak. Its natural range is from Mexico to New Jersey, but of late years it has spread northward, where it remains through the winter in city parks and village gardens as far as Central New England. The male is a beautiful red marked with black and adorned with a tall crest. It has a loud, melodious, whistling song, is hardy in confinement, and is kept as a cagebird. It nests in bushes or vines, fashioning a grass-lined nest of twigs, bark, and rootlets. The eggs are white or bluish, speckled with brown.

Cardinal Flower. See LOBELIA.

Cardinal Virtues, according to Plato and other Greek philosophers, were justice, prudence, temperance, and fortitude. Upon these four all other moral virtues were thought to hinge. Roman Catholic theology differentiates the moral and theological virtues, the former all springing from the four cardinal virtues, the latter being faith, hope and charity. See ETHICS.

Carding, the process of combing wool, flax, or cotton. See SPINNING.

Cardiograph, an instrument which records the movements of the heart by tracings, for the purpose of physiological and pathological research. One form, the electrocardiograph, is based on the fact that the electric currents produced in the human body by the activity of the heart muscle can be led off from the extremities and may be measured and recorded by a sensitive string galvanometer.

Car'dioid, a heart-shaped curve which may be considered the path of a point on the circumference of a circle which rolls on another circle of equal size.

Carditis, kär-dī'tis, inflammation of the heart. The term is chiefly used in the more particular expressions *pericarditis* (inflammation of the outside covering), *endocarditis* (of the lining), and *myocarditis* (of the muscular substance). See HEART.

Cardoon' (*Cynara cardunculus*), a thistle-like plant closely allied to the artichoke (*C. scolymus*), but taller and more prickly, sometimes reaching a height of eight or ten feet. It is a perennial, native to Southern Europe and Northern Africa and little known in the United States. It is raised from seed sown in May. In the fall the plants are blanched, and the heart is eaten as a salad or pot-herb.

Cardoon
Flower and edible central leaves.

Cardross, kär'drôs, village, Scotland, in Dumbartonshire, on the Clyde, 3½ miles northwest of Dumbarton. At Cardross Castle, Robert the Bruce died, on June 7, 1329. Near it is Dalquharn House, where Smollett the novelist was born. Pop. of parish (1921) 11,609.

Cards, PLAYING. The earliest mention of distinct series of cards occurs in the household accounts for 1392 of Charles VI. of France. The earliest pictorial representation of a game of cards occurs in a French MS., the dates assigned varying from 1330 to 1400. In an edict (1397) of the provost of Paris, working-people are forbidden to play certain games on working days, and among these cards are mentioned; in 1369 an ordinance of Charles v., similarly forbidding certain games, had no mention of cards. From this it is inferred that cards became popular in France between these dates. Covelluzo, a 15th-century writer, says that cards were introduced into Italy from Arabia in 1379; a statement unsupported by details. Early in the 15th century the manufacture of cards had become established in Germany, by 1425 in Italy, and before 1463 in England. In America they were brought over by the colonists.

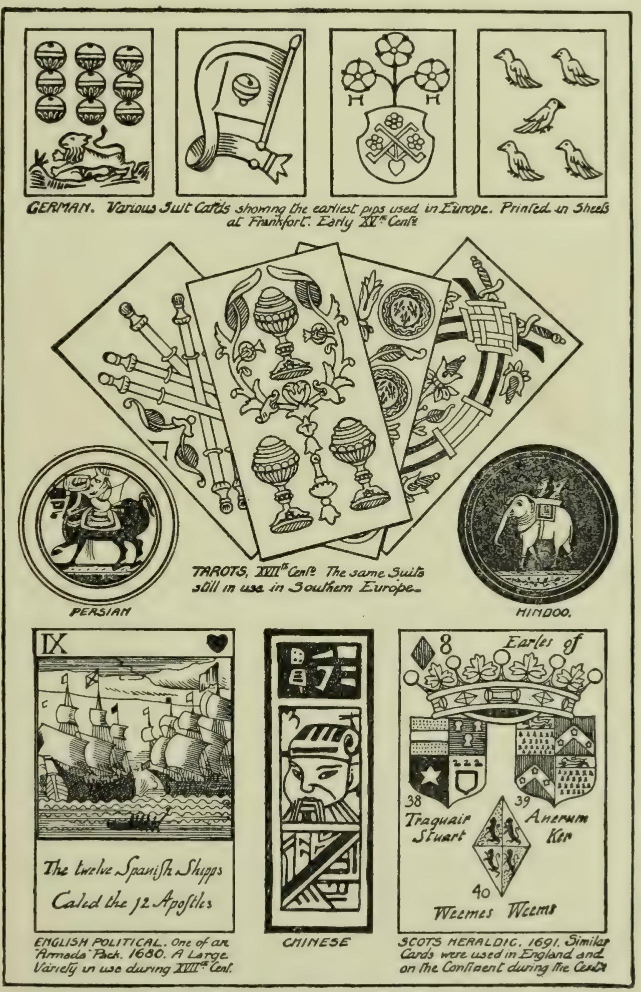
The earliest cards used in Britain were hand-painted. The court (or, more correctly, *coat*) cards were then king, chevalier, and knave, the queen being subsequently introduced in place of the chevalier. The pips were first, in German cards, hearts, bells, leaves, acorns; next came especially on Italian cards, swords, batons, cups, money. In the 16th century the French adopted those now common in Britain—to wit, hearts, clubs, spades, and diamonds.

Besides the cards in common use, designated 'numeral' cards, there are also *tarots*, also called *atouts*, *atutti*, and *triomphes* (trumps), because they override numeral cards in games combining the two kinds. Whether tarots were earlier than the ordinary numeral cards is still undecided. A pack of tarots consists of 78 cards, comprised of 22 emblematic and 56 ordinary cards, divided into 4 suits of 14 cards each —*viz.* 4 coat cards (king, queen, chevalier, and valet) and 10 point or pip cards, numbered from 1 to 10. The game played with these cards is called *tarocchi.*

As to the Eastern origin of cards, and the theories connecting them with early Eastern occult philosophy, Dr. Willshire regards them as of too recondite and shadowy a character to admit of satisfactory discussion. He inclines to the belief that Italy was the European country, and Venice the district in which they first appeared. A Swiss monk, in a MS. of 1377, says the *ludus cartarum* came to Switzerland that very year. See S. W. Singer's *Researches into the History of Playing Cards* (1816); W. A. Chatto's *Facts and Speculations on the Origin and History of Playing Cards* (1848); T. Willshire's *Descriptive Catalogue of Playing and other Cards in the British Museum* (printed by order of the trustees, 1876); Taylor's *History of Playing Cards* (trans. from the French of D'Ambly, 1885); 'Playing Cards of various Ages and Countries,' from Lady Charlotte Schreiber's *Collection* (3 vols. 1892–5).

Carducci, Giosuè (1836–1907), Italian poet, born at Valdicastello. His boyhood was spent near the Pisan Maremma, and it is probable that the austere aspects and classic associations of this desolate region profoundly affected both the quality of his imagination and the character of his style. It was for his erudition, and not because of his achievements as a poet (for his first volume, *Rime*, 1857, and the scattered poems afterwards reprinted as *Juvenilia*, have only a relative value), that in 1860 he was appointed to the chair of Italian literature at Bologna.

Although for some years (1861–67) immersed in his lectures, it was during this fruitful period that he wrote (in 1863—and, it is said, at a sitting) the now universally celebrated *Hymn to Satan.* In this poem, however, it is not the Mephistopheles of Goethe, nor the Lucifer of Milton, and still less the vulgar Devil of the common tradition, that is meant, but the principle of revolt, of insurgence, against effete conditions, usages, and ideas. The most famous of his poetical works are the three series of *Odi Barbare* (1877, 1882, and 1889). In style occasionally pedantic and often ultra-remote



GERMAN. Various Suit Cards showing the earliest pips used in Europe. Printed in Sheets at Frankfort. Early XV^th Cent^y

TAROTS, XVII^th Cent^y The same Suits still in use in Southern Europe.

PERSIAN

HINDOO.

ENGLISH POLITICAL. One of an "Armada" Pack. 1680. A Large Variety in use during XVII^th Cent.

CHINESE

SCOTS HERALDIC. 1691. Similar Cards were used in England and on the Continent during the Cent^y

Playing Cards: some primitive Designs.

and severe, his poetry counts at its best among the noblest in the classical tradition written by any modern poet in any country. In 1906 Carducci was awarded the Nobel prize for literature. In 1900–1 a complete edition of the poetical writings was issued in one volume. See 'Italian Poets of To-day,' in the *Quart. Rev.* (July – September, 1902), and the brief biography and translation excerpts in G. A. Greene's *Italian Lyrists* (1893).

Carduchi, a people who dwelt in the mountains of modern Kurdistan; most likely the ancestors of the modern Kurds.

Cardwell, Edward (1787–1861), English ecclesiastical historian; became successively Camden professor of ancient history (1826–61), rector of Stoke Bruern, Northamptonshire (1828), and principal of St. Alban Hall, Oxford (1831). His published works include *Lectures on the Coinage of the Greeks and Romans* (1833); *Documentary Annals of the Reformed Church of England* (2 vols. 1839); *Hist. of Conferences* (1840; 3rd ed. 1850); *Synodalia: a Collection of Articles of Religion* (1842); *Reformatio Legum Ecclesiasticarum* (1850).

Cardwell, Edward, Viscount (1813–86), English statesman, was born at Liverpool. He entered Parliament for Clitheroe in 1842 and was returned for Liverpool in 1847, but lost his seat in 1852. In the same year he was elected for Oxford city. He was successively Secretary to the Treasury (1845), President of the Board of Trade (1852–5), Chief Secretary for Ireland (1859–61), Chancellor of the Duchy of Lancaster (1861), Secretary to the Colonies (1864–6), and in 1868 was appointed Secretary of State for War, the office with which his name is most associated. In 1871–2 he carried out a great scheme of army reform. See Biddulph's *Lord Cardwell at the War Office* (1904).

Care Sunday, Carle Sunday, or Carling Sunday, the Sunday previous to Palm Sunday, is the Scottish name for Passion Sunday. 'Carlings' are fried or roasted peas.

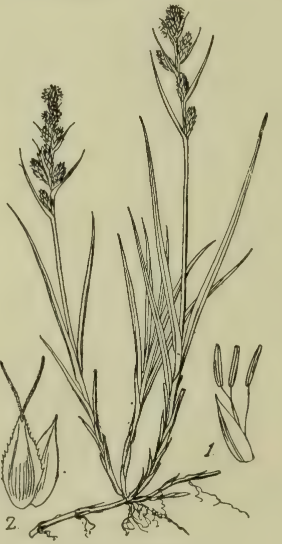
Careme. See Quadragesima.

Carême, Marie Antoine (1784–1833), French cook, was born in Paris; became cook first to Talleyrand, afterwards to the Prince Regent (George IV.) of England, and the Empress of Russia and of Austria. His name is proverbial for artistic cookery. He was *chef* at the congresses of Aix-la-Chapelle, Vienna, and Laibach. He wrote *Le Pâtissier Pittoresque* (4th ed. 1842); *Le Maître d'Hôtel Française* (2nd ed. 1842); *L'Art de la Cuisine Française aux XIX*^{e} *Siècle* (1833).

Carew, George, Baron Carew of Clopton and Earl of Totnes (1557–1629), English statesman. He defeated Rory Oge O'More (1577), and was given command of the troops in Ireland (1579); then master of ordnance in Ireland (1588–92). After service with the expeditions to Cadiz (1596) and the Azores (1597), he was employed as envoy to France (1598).

Carew, Richard (1555–1620), English antiquary, born at Antony, East Cornwall; translated and published the first five cantos of Tasso's *Godfrey of Bvlloigne, or Jerusalem Delivered* (1594), and a *Survey of Cornwall* (1602).

Carew, Thomas (*c.* 1594–1639), English poet, of Cornish blood, but born at W. Wickham, in Kent; travelled in Italy, and The Hague; went in 1619 to France, and thereafter became gentleman of the privy chamber, and later sewer to Charles I. His poetry, of which little was published in his lifetime, consists chiefly of occasional verses and love lyrics to an unidentified Celia. It shows the influence of John Donne. Carew belonged to the poetic circle that gathered round Ben Jonson, and he had a special friend in Sir John Suckling. His works are *Cœlum Britannicum*, a masque (1643); *Poems* (1640); *Collected Works*, by W. C. Hazlitt (1870), J. W. Ebsworth (1893), A Vincent (1899).



Carex arenaria.

1, Male flower; 2, female.

Carex, a genus of perennial grasslike herbs frequenting the water-side, mostly in temperate climates. They are commonly known as sedges, and the spikes of unisexual flowers are conspicuous objects in many ponds. They are mostly easy to cultivate in moist garden soil, though a few require a pond to do themselves justice. Among the species best worth cultivating are *C. Morrowi*, whose pointed leaves are decorated with an edging of white; *C. pseudo-cyperus*, with drooping flowers; and the Indian *C. baccans*, with beautiful panicles of red berries in due season. Owing to the creeping, spreading habit of its roots, *C. arenaria* is employed to bind sand-dunes such as those which occur along the shores of the North Sea and of the Baltic Sea.

Carey, Henry (?1690–1743), English poet and musician, is believed to have been the illegitimate son of George Savile, Marquis of Halifax. His first volumes of poems appeared in 1713; others in 1720 and 1729. He wrote farces, burlesques, and dramatic pieces, frequently with the accompanying music. His best-known poem is *Sally in our Alley*. A claim, later discovered to be unfounded, was advanced that he was the author and composer of *God save the King*.

Carey, Henry Charles (1793–1879), American political economist, son of Mathew Carey, was born in Philadelphia, Pa., and took a position in his father's bookstore at the age of eight years, where he remained until he was made a partner on attaining his majority. His father retired in 1821, and he became head of the firm of Carey & Lea, at one time the largest publishing house in the country, retiring himself in 1835 to pursue his studies in political economy. Mr. Carey believed in free trade as an ideal eventually to be reached, but he vigorously advocated protection as adapted to the actual and historical situation. His first book, *An Essay on the Rate of Wages* (1835), was expanded and reissued as *The Principles of Political Economy* (3 vols., 1837–40), which was translated into several foreign languages. Some of Mr. Carey's later books were *The Credit System in France, Great Britain, and the United States* (1838), *The Past, the Present, and the Future* (1848), *Letters on the International Copyright* (1853), *Principles of Social Science* (3 vols., 1858–9), and *Miscellaneous Works* (1869). See Elder's *A Memoir of Carey* (1880).

Carey, James (1845–83), Fenian, was born in Dublin, and was by trade a bricklayer. Joining the Fenian conspiracy (1861), he became one of the founders of the Invincibles (1881). On May 6, 1882, Lord Frederick Cavendish and Thomas Burke, permanent Irish under-secretary, were murdered by Fenians in Phœnix

Park, Dublin, the victims having been pointed out by Carey. He turned queen's evidence, but was murdered on board a vessel near Cape Town by Patrick O'Donnell.

Carey, Matthew (1760–1839), Irish-American publisher, was born in Ireland, and was the son of a Dublin baker, who gave him his choice of trades. He selected that of printer and bookseller, and at the age of seventeen published an address to Roman Catholics of so fiery a nature that he was obliged to seek refuge in France, where he was employed by Franklin. Returning to Ireland, he conducted the Dublin *Freeman's Journal* (1781) and established the *Volunteer's Journal* (1783), the latter of which papers gained a high degree of political influence. Carey's attacks on the British Government led to his temporary imprisonment, and in 1784 he removed to Philadelphia, being assisted by Lafayette. He there established the *Pennsylvania Herald*, the first American paper to give legislative reports, and was connected with other periodicals until 1791, when he started a bookselling and publishing business, with which he was associated until his retirement in 1821, being succeeded by his son, Henry Charles Carey. With Bishop White and others he founded (1796) the first American Sunday-school society. He wrote a number of pamphlets on current questions. His *Autobiography* appeared in the *New England Magazine* (1833–4).

Carey, Rosa Nouchette, English writer of stories for girls, born in London; began her career as a novelist in 1868, and since then has produced about thirty novels, including *Barbara Heathcote's Trial* (1871), *Nellie's Memories* (1868), *Uncle Max* (1887), *The Mistress of Brae Farm* (1896), *My Lady Frivol* (1899), *Trivial Round* (1900), *At the Moorings* (1904).

Carey, William (1761–1834), English missionary, was born at Paulerspury, Northamptonshire. Chosen as the first Baptist missionary to India (1793), he arrived in Calcutta (1794), studied the Bengali dialects, and preached in the vernacular in 1795. Having founded the Serampur mission in 1799, he was professor of Oriental languages at the college of Fort William until 1830. He published Marathi, Sanskrit, and other grammars and dictionaries, and portions of the Bible in about forty Oriental languages, besides editing the *Ramayana* (1806–10). See *Memoirs* (1856), and *Life of William Carey*, by George Smith (1885).

Carfax. See Oxford.

Cargill, Donald or Daniel (1619–81), Scottish Covenanter, was born at Rattray, Perthshire. Opposed to the restoration, he denounced those who accepted the Indulgence in 1672, and became a field preacher. He fought at Bothwell Bridge (1679), and took part with Richard Cameron in the Sanquhar declaration (June 22, 1680). For excommunicating the king and others at Torwood, near Stirling, he was captured (Sept. 12, 1680), and executed at the cross of Edinburgh.

Cargo. See Bill of Lading, Charter-party, Freight, Insurance.

Carhart, Henry Smith (1844), American physicist, was born at Coeymans, N. Y., and graduated (1869) at Wesleyan. After several years of teaching and study, he was appointed professor of physics at Northwestern University, resigning in 1886 to accept the same chair at the University of Michigan. He was a member of the jury of awards for electricity at several world's fairs in the U. S. and abroad, and has held office in learned societies. His text-books include *Primary Batteries* (1891), *University Physics* (1894–6), and *Electrical Measurements* (1895).

Caria, the s.w. region of Asia Minor. The coast was largely occupied by Greek colonists: in prehistoric times the interior was held by the Leleges, a people akin to the pre-Hellenic population of Greece; later, by the Carians proper, a race akin to the Lydians. Caria was a principal source of the slave trade for Greece. In the 4th century B.C., its native princes, of whom Mausolus is the best known, rose to wealth and power, though they were then tributary to Persia. Alexander the Great conquered the country in 334 B.C. Under the later Roman republic the pirates of Caria and Cilicia were notorious; they were suppressed by Pompey in 66 B.C.

Cariaco, seapt., Venezuela, 30 m. E.N.E. of Cumana, near the head of the Gulf of Cariaco and on river of same name. Its docks are at Puerto Sucre on the gulf, which is well sheltered. Pop. 7,000.

Cariama, or Seriama. See Screamer.

Caribbean Sea, division of the Atlantic Ocean, from which it is separated by the West India islands, while on the s. it is enclosed by Venezuela and Columbia, and on the w. by the Central American states and Mexico. At the N.W. it connects with the Gulf of Mexico through the Yucatan Strait. A broad submarine plateau, nowhere exceeding 1,000 fathoms in depth, between British Honduras and Jamaica, divides it into two deep basins. Of these, the eastern has a general depth over 231,000 sq. m. of 2,600 fathoms, and a maximum depth of 2,844 fathoms. The western basin has about the same mean depth, but is much less in extent, and in a narrow trough sinks to a much greater depth—*viz.* 3,428 fathoms. In many respects the Caribbean Sea resembles the Mediterranean, both, for instance, filling primitive depressions of the earth's crust, and both being inland seas.

Caribbee Islands, the name given to the chain of West India islands which begin with Saba, on the N., and end with Grenada, on the S. The chain consists of eleven conspicuous members, including Saba, St. Eustatius, St. Christopher (St. Kitts), Nevis, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, and Grenada. Saba and St. Eustatius are Dutch; St. Kitts, Dominica, Montserrat, and Nevis, English; Guadeloupe and Martinique, French; and from Martinique southward the remainder are British possessions. See West Indies.

Caribou. The American name, derived from an Indian language, of the reindeer of North America, of which several forms exist, regarded by some as mere varieties of the European reindeer, by others as distinct species. They occur throughout the wooded districts of Canada and somewhat within the northern boundaries of the United States, in Maine and near Lake Superior, ranging the woods in bands, and particularly haunting swampy districts, where their broad, loosely connected hoofs enable them to travel. Their flesh and skins are of great value to the Indians, but except in winter their hunting is very difficult. The foregoing remarks apply to the 'woodland' caribou, ranging in a variety of slightly differing forms from Newfoundland to Alaska; but a quite different Arctic form is known as the Barren Grounds caribou, and is found on the Arctic coasts east of the Mackenzie River, and also in Greenland. These caribou assemble in the fall in enormous herds and migrate southward to the borders of the wooded lands, then return northward in the spring. During these migrations large numbers of them are killed by the Eskimos and Indians of those regions, and are their main dependence for animal food. Their characteristics and habits are essentially the same as those of the European reindeer, but they are not domesticated. See A. J. Stone in Whitney's *The Deer Family* (1903); and E. Ingersoll, *Life of Mammals* (1906).

Caribou, vil., Aroostook co., Me., 53 m. N. by W. of Houlton, on the Aroostook R. and on branches of the Bangor and Aroostook and the C. P. R. Rs. It has lumber and shingle mills, sash and door factories, flour mills, carriage works, woollen mills, foundry, etc. Pop. (1910) 5,377. See CHESUNCOOK LAKE.

Caribs, S. American Indians, whose original home has been traced to the head-waters of the Xingu and other southern affluents of the Amazon in Central Brazil. Here they are still represented by the Bakaïri and other primitive tribes. Hence it is assumed that the Carib migrations spread from this region through the Guianas and Venezuela north to the W. Indies, Nicaragua, and Honduras. From the W. Indies all these tribes had disappeared before the close of the 18th century, the last survivors having been removed from St. Vincent to the Bay Is., Honduras, in 1796. But elsewhere numerous Carib communities are still found scattered over an immense area from Trinidad to Central Brazil. They possess, however, no kind of political or social coherence; their kinship rests entirely on their common speech, a highly polysynthetic stock language, represented by a great number of extremely divergent branches and dialects.

When first brought into contact with Europeans, the Caribs were a fierce, restless people, marauders on the mainland, corsairs on the high seas, and undoubted cannibals—this very word (*canibal*) being a Spanish formation from *Canib = Calib = Carib.* The Caribs are physically a fine race, above the average height, shapely and robust, with long face, slightly oblique eyes, reddish-brown complexion, long, lank, black hair, and features of a somewhat softened Indian type. See Im Thurn's *Among the Indians of Guiana* (1883); Stoddard's *Cruising Among the Caribbees* (1895).

Caricature, a representation, usually pictorial, in which the salient characteristics of a person or persons are made ludicrously prominent. Fundamentally, dramatic mimicry is caricature, and caricature in its crudest form. We see it inherent in monkeys in a marked degree, as also among low races of men; and it is the first resort of the uneducated in an effort to belittle an opponent. For ages, also, in all civilized countries, caricature or burlesque has held a recognized position on the stage. In literature, moreover, its place is equally well defined. But a caricature is, before everything else, a pictorial or sculptured representation, generally satirical, sometimes offensive to the extreme of grossness, but often executed with the most perfect good-nature, a gentle raillery taking the place of satire or malice. Egyptian papyri, Etruscan vases, Greek pottery, the walls of Rome, Herculaneum, and Pompeii, and the ruins of Yucatan all afford evidence of a love of caricature, whether displayed in mere rude *graffiti* (wall scribblings) or in much more skilful and elaborate representations. Some of these are wonderfully modern in style and feeling. In Thomas Wright's *History of Caricature* (Lond. 1865) there are ancient Greek caricatures of a 'Romeo and Juliet,' scene, and of 'Apollo at Delphi', which would not seem out of place in the pages of *Punch.* Perhaps the *graffiti* appeal even more strongly to the modern mind, consisting as they do of pointed and personal references to contemporary citizens, glossed with a few explanatory words.

Of living nations, none is imbued more strongly than the Japanese with this love of caricature. The tendency is nowhere more powerfully and cleverly displayed than in their pictures of the aboriginal Aïnos.

The discovery of printing gave an immense impetus to this phase of art. It is in the 15th century, therefore, that the real efflorescence of caricature in Europe begins, especially in connection with the names of Holbein and Cranach. And just as the early Christians were caricatured in Pompeii on account of their religion, so we find Martin Luther and his fellow-reformers satirized in this way as the preachers of new ideas, though not of a new religion. The end of the same century saw the birth of Jacques Callot, who is usually included among caricaturists on account of his keen satirical humor and the intense vivacity of his figures, which, however, are not strictly caricatures. In the 18th century genuine caricature had reached its full growth, and Hogarth was its unsurpassable exponent. In its very lowest phases the art was also then represented by the woodcuts of popular broadsheets and chapbooks, coarse in execution, and vulgar and sometimes indecent in tone—a style of art prolonged through the 19th century and even into the 20th, and exemplified by the 'comic' valentines of the early Victorian period, and by the equally comic illustrations in certain foreign journals of the baser sort.

The contemporaries Gillray (1757–1815) and T. Rowlandson (1756–1827) were caricaturists of the first rank, and not less notable were their successors, Cruikshank, Thomas Landseer, Leech, Tenniel, Richard Doyle, and Hablot K. Browne ('Phiz'), the last named chiefly known by his illustrations of Dickens's novels, and most of the others by their work in *Punch* and in Gilbert à Becketts *Comic Blackstone* (1886), *Comic History of England* (1847), and *Comic History of Rome* (1852). A bright light, too early extinguished, was Randolph Caldecott (1846–86), whose style, while never becoming farcical, was always characterized by that touch of exaggeration necessary to true caricature. Linley Sambourne, E. T. Reed, Harry Furniss, the late Phil May, and F. C. Gould (*Westminster Gazette*) are all caricaturists in the strictest sense; and George du Maurier, whose name, like theirs, is chiefly associated with *Punch*, may also be grouped with them, although his *métier* was rather to depict modern London society, with a special eye to its foibles. Pellegrini ('Ape'), Leslie Ward ('Spy'), and Max Beerbohn ('Max') have respectively made the existing London weekly, *Vanity Fair*, famous for its caricature-portraits.

While the War of 1812, the various political campaigns of the first half of the 19th century, the Mexican War, and the Abolition agitation were the subjects of a great number of crude prints, American caricature, in the broadest sense, began with Thomas Nast, whose pictures in *Harper's Weekly* in 1868, 1869, and 1870 did much to bring about the destruction af the Tweed Ring. Nast's immediate successors were Keppler and Gillam. By the end of the 19th century caricature, both political and social, had become a strong feature of American journalism. Among the best-known American caricaturists of the present day are F. B. Opper, who has had success both as a political cartoonist and as a creator of whimsical pictorial characters and episodes after the style of the German, Busch, John T. McCutcheon, who is best known by his humorous drawings of life in the small towns of the Middle West, Homer Davenport, W. A. Rogers, Edward Kemble, of 'Kemble's Coons' fame, C. G. Bush, T. E. Powers, and R. F. Outcault. As a pictorial historian of the social types and customs of his time, C. D. Gibson has won a position of considerable eminence, although he can hardly be deemed a caricaturist in the full sense of the term.

BIBLIOGRAPHY. See Wright's *Caricature Under the Georges* (1875); Wright's *Life of Gilray;* Parton's *Caricature and other Comic Arts Album* (1877); Jean Grand Carteret's *Caricature en Allemagne;* Spellman's *History of Punch;* Punch's *Victoria Era;* Maurice and Cooper's *History of the XIXth Century in Caricature* (1901).

Caries is a condition in bone corresponding to ulceration of soft parts. It is peculiar to spongy bone, and is found mostly in the spinal vertebræ, in the shaft of the long bones, and in the short bones of the wrist and ankle. The teeth also undergo caries, but this is neither syphilitic, tubercular, nor suppurative as is caries elsewhere. In *caries necrotica* the bone becomes disorganized, crumbles, and comes away in particles. Caries more generally signifies syphilis or tuberculosis (*strumous caries.*) First there is a fluctuating swelling over the bone, with pain and tenderness; and later the suppurative process which has been going on in the bone channels a way to the surface; through this sinus is discharged caseous matter containing bits of necrotic bone. In 'dry' caries, which is, sometimes at least, of tubercular origin, there is no suppuration, discharge, or swelling, but there are pain, and, if it be near a joint, stiffness, with possibly an atrophy of the surrounding soft parts. Radiography is used to show the condition of the bones where no sinus has been formed.

Treatment. — Specific infections must be treated and the general health must be improved as far as possible by tonics, fresh air, good feeding, and local rest. Phosphate of lime internally has lately been strongly recommended to help in healthy bone-formation. Surgical treatment consists in removing the diseased bone, or its diseased part, and scraping the cavity, with antiseptic precautions. See Necrosis.

Carigara, kä-rē-gä′rä, pueblo, Leyte, Philippine Islands; 21 miles northwest of Tacloban. It is an important hemp port. Pop. (1918) 17,558.

Carillon. See Bell.

Carimata, kä-rē-mä′tä, or Karimata, group of islands (over 100 in number) in the East Indian Archipelago, lying off the west coast of Borneo; area, 58 square miles. The chief town is Palembang, on Grand Carimata, the largest of the group. The industries are iron-mining and fishing. Pop. 500.

Carinatæ, a division of birds which includes all living forms except the few running birds or Ratitæ—*e.g.* ostrich, emu, cassowary, etc. The name refers to the carina, or keel, on the breastbone; but there are a few carinate birds—*e.g.*, the extinct dodo —in which this keel is virtually absent. See Birds.

Carini, kä-rē′nē, town, Sicily, in the province of Palermo; 17 miles west of Palermo. It was the ancient town of Hycarra, from which the Athenians carried away the famous courtesan Laïs. Pop. 14,000.

Carinthia (Ger. *Kärnthen*), ka-rin′thi-*a*, province of Austria lying between Tyrol on the west and Styria on the east; area 3,680 square miles. It is markedly mountainous, and is drained from west to east by the Drave. Various passes, as the Predil, the Loibl, the Seeberg, and the Arlscharte, lead across the Alpine ranges, and there are beautiful lakes and mineral springs in the vicinity of Villach. The climate in the mountainous parts is severe, but in Klagenfurt, towards the east, the annual mean temperature is 45.5° F. Only 9 per cent. of the surface is unproductive, half the remainder being covered with forests, and the rest affording meadow and grazing land. Iron, lead, zinc, and lignite are mined. The most important industries are connected with these metals, but there are also manufactures of wood pulp, cement, cloth, and leather, and saw-milling. Klagenfurt and Villach are the chief commercial centres, the former being the capital. The population (1921) is 370,748. Two-thirds of the people are of German race, most of the remainder being Slovenes; 95 per cent. are Roman Catholics.

Carinus, Marcus Aurelius, emperor of Rome (283–285 A.D.), the elder of the two sons of the Emperor Carus. Soon after his accession the troops in Asia put forward Diocletian as a rival. Carinus won a decisive victory over the new claimant near Margus, in Mœsia, but immediately afterward was murdered by some of his officers.

Carisbrooke, kar′is-bro͝ok, village, Isle of Wight, England; about a mile southwest of Newport. The Priory Church has a fine tower of the twelfth century and the old castle is one of the most interesting in England. In it Charles I. was imprisoned (1647–48), and here his daughter Elizabeth died in 1650. Within the castle is a remarkable well, 200 feet deep. The building dates back to a time before the Roman invasion, but the outworks were erected when the advent of the Spanish Armada was imminent.

Carissa, a genus of white-flowered tropical shrubs belonging to the natural order Apocynaceæ, and bearing berry-like fruits. They are easily grown in greenhouses in a peaty soil, and may be propagated by means of cuttings. They are half-hardy in the extreme Southern United States. Among the species are the evergreen Christ's thorn, *C. carandas*, which bears red fruits, used both for pickling and for dessert; the Natal plum, *C. grandiflora;* and the S. African *C. arduina*, which bears red fruits, not unlike raspberries in flavor and excellent for preserves.

Carissimi, kä-rēs′sē-mē, Giacomo (1604–74), Italian musical composer, was born in Marino, near Rome. In 1624 he was appointed conductor of the choir at Assisi, and in 1628 removed to Rome, where he had obtained a similar appointment at St. Apollinaris. Carissimi's most important work was done in the direction of developing and perfecting the sacred cantata and recitative, and in improving instrumental accompaniments. His principal oratorios—*Jephta* (considered to be his best), *Judicium Salomonis*, *Baltazar*, and *Jonas*—have been published by Chrysander in the second volume of the *Denkmäler der Tonkunst* (1882).

Caritat. See Condorcet.

Carit Etlar, the pen-name of the Danish novelist and dramatist, Johan Karl Christian Brosböll (1816–1900), who was born at Fredericia. He was one of the most popular writers of Denmark in the 19th century, excelling especially in historical romances and tales of Jutland life. He also wrote plays, but in point of artistic merit these cannot rank with his novels.

Carlaverock, kär-lav′er-uk, parish, Scotland, in Dumfriesshire, on the coast , 5½ miles southeast of Dumfries. In the parish churchyard is the grave of Richard Paterson, the original of Scott's Old Mortality. The castle (Scott's Ellangowan) was built about 1220, and was captured by Edward I. in 1300. Pop. (1921) 799.

Carlen, Emilia (1807–92), Swedish novelist, better known as Flygare-Carlén, was born at Strömstad. Her many works portray popular life and customs, especially on the Kattegat coast, and are characterized by a deep feeling for natural beauty and a vivid style. Of her novels, many of which have been translated into English, the most notable are *The Professor and his Favorites* (1840; Eng. trans. 1843); *The Rose of Tistelön* (1842; Eng. trans. 1844); *The Hermit* (1846; Eng. trans. 1853); *Gustavus Lindorm* (1839; Eng. trans. 1853); *En Natt vid Bullan Sjön* (1847); and, probably her best, *Ett Köpmanshus i Skärgarden* (1859).

Carleton, kärl′tun, Henry Guy (1856–1910), American dramatist, was born in Fort Union, N. M., the son of Gen. James H. Carleton (q.v.). He recevied his education at Santa Clara College, Cal.,was appointed second-lieutenant in the 8th U. S. cavalry (1873), served with Miles in Texas, and resigned in 1876. He then entered journalism, was associate editor of the New Orleans *Times*, literary editor of *Life*, and a special writer for the New York *World* and other papers. At different periods of his life he devoted much attention to the study of electricity, and invented numerous electrical appliances. He began his dramatic work in 1881. His plays include *Memnon*, blank verse (1881); *Victor Durand* (1885); *The Pembertons* (1889); *The Lion's Mouth* (1890); *Ye Earlie Trouble* (1891); *A Princess of Erie* (1892); *A Gilded Fool* (1892); *The Butterflies* (1894); *That Impudent Young Couple* (1896); *Ambition* (1896); *Colinette* (1898); *Jack's Honeymoon* (1898).

Carleton, James Henry (1819–73), American soldier, was born in Maine. He entered the U. S. army as a second-lieutenant of dragoons in 1839 and served in the Mexican War (1846–7), winning the brevet of major at Buena Vista. He was a Federal officer in the Civil War, becoming a brigadier-general of volunteers in April 1862, and in March 1865 receiving the brevet of brigadier-general in the regular army for his services in New Mexico and the brevet of major-general, both in the volunteer and regular service, for 'meritorious service during the war.'

Carleton, Will (1845–1912), American poet, was born in Hudson, Lenawee county, Mich., and was graduated (1869) from Hillsdale College. He engaged in journalism in Chicago and Hillsdale, but soon devoted himself to the writing of poems of domestic life, some of which, notably 'Betsy and I are Out' and 'Over the Hill to the Poor House,' attained great popularity. They were singularly adapted for recitation, and Mr. Carleton for many years gave readings of his works in the United States, Canada, and Great Britain. His published volumes include *Poems* (1871); *Farm Ballads* (1873); *Farm Legends* (1875); *Farm Festivals* (1881); *City Ballads* (1885); *City Legends* (1889); *City Festivals* (1892); *Songs of Two Centuries* (1902); *Poems for Young Americans* (1906); *A Thousand Thoughts* (1908).

Carleton, William (1794–1869), Irish novelist, was born in Prillisk, county Tyrone. He was for a time a tutor in the village school but in 1830 went to Dublin where he published *Traits and Stories of the Irish Peasantry* (2d. series, 1883); *Tales of Ireland* appeared in 1834, and in 1839 *Fardorougha the Miser*, a remarkable work which was dramatized, followed by the *Misfortunes of Barney Branagan* (1841), *Valentine M'Clutchy* (1845), and others. Carleton's tales are characterized by pathos and vigor and furnish an accurate picture of Irish peasant life.

Carleton College, a co-educational institution of higher learning situated in Northfield, Minn. It was founded in 1866, and is named in honor of William Carleton of Charlestown, Massachusetts, an early donor. It is non-sectarian in control, but maintains relations of co-operation with the Congregational, Baptist, and Episcopal denominations. Four-year courses in the liberal arts are offered. The campus, including the Lyman Memorial Lakes and athletic fields, comprises about one hundred acres. Adjoining is the college farm of three hundred acres. Attendance is limited to eight hundred and fifty. For recent statistics see Table under the heading College.

Carleton Place, town, Ontario, Lanark county, on the Canadian Pacific Railway and on Mississippi Lake, at the head of its outlet which is navigable from the St. Lawrence; 30 miles southwest of Ottawa. Its manufactures include lumber, woollen and iron goods, and it has machine shops and foundries. Pop. (1911) 3,621; (1921) 3,841.

Carli, Giovanni Rinaldo, Count (1720–95), Italian antiquary, was born in Capo d'Istria; became professor of astronomy and navigation at Padua; and was later appointed president of the new council of finance and public instruction at Milan (1771), where he induced Joseph II. to abolish the Inquisition. He is said to have originated index numbers (q.v.). His works include a three-volume treatise on Italian coins, *Della monete e dell' istituzione delle zeche d'Italia* (1754–60), *Antichitā italiche* (5 vols. 1788–91), *L'Uoma libero* (1772) against Rousseau's social theories, and *Lettere Americane* (1780–81).

Carling, Sir John (1828–1911), Canadian public official, was born in London, Ontario. He represented London in the General Assembly from 1857 until the confederation of the Dominion, and held the posts of receiver-general of Canada (1862), minister of agriculture and public works for Ontario (1867–71), postmaster-general for the Dominion (1882–5), Dominion minister of agriculture (1885–92). From 1892 to 1895 he was a cabinet minister without portfolio, and in 1896 became a senator. He was knighted in 1893.

Carlingford, seaport town, Ireland, in County Louth, on the south side of Carlingford Lough; 13 miles northeast of Dundalk. It is a charmingly situated and popular seaside resort, and has valuable fisheries, especially of oysters. There are ruins of King John's castle and of a monastery of the 14th century. The town claims to be the landing place of St. Patrick in 432. Pop. 600.

Carlingford Lough, an inlet 10 miles long by 2 miles wide, between counties Down and Louth, 9 miles northeast of Dundalk. The Newry Canal connects it with Lough Neagh. The entrance, which is rocky and shoaly, is guarded by five lighthouses.

Carlinville, city, Illinois, county seat of Macoupin county, on the Chicago and Alton Railroad; 48 miles northeast of East St. Louis. Coal is mined in the vicinity, and there are flour mills and brick yards. Pop. (1910) 3,616; (1920) 5,212.

Carling Sunday. See Care Sunday.

Carlisle, kär-līl', city, England, in Cumberlandshire, on the River Eden; 300 miles northwest of London. Its port is Silloth, 21 miles distant, and it is an important railway centre. Features of interest are the cathedral, founded as a priory church in 1092, and converted into a cathedral in 1133, and the castle, situated on a promontory overlooking the Eden, with massive Norman keep with double gates and portcullis. The citadel, at the southeast entrance to the city, consists of two large drum towers, rebuilt in 1810; it is now used for the court of assize and jail. Other public buildings are the town hall and the guildhall (both ancient), city hall, county infirmary, general and fever hospitals, museums, art gallery, library, and science and art schools (installed in a 17th-century mansion and adjacent new buildings), and city cross (1682). Industries include cotton manufactures and dyeworks, ironfounding, and brewing, and there are large railway shops.

Carlisle was a Roman station near the Roman wall. The place was destroyed by the Danes (875). William Rufus built the castle and commenced the fortifications (1092), but the latter were not completed till the time of David, king of Scotland (1084–1153). During the civil war it was occupied alternately by the Royalists and the Parliamentarians, the latter gaining possession after a rigorous siege (1647). It also shared in the troubles of 1745, when several persons were hanged on Gallows' Hill. Pop. (1921) 52,600.

Carlisle, borough, Pennsylvania, county seat of Cumberland county, on the Cumberland Valley and the Gettysburg and Harrisburg Railroads; 17 miles southwest of Harrisburg. It is the seat of the U. S. Indian Training and Industrial School, of Dickinson College and of the Metzger Institute for Girls. Its manufactures include cars, carriages, axles, carpets, shoes, and flour. Carlisle mineral springs are in the vicinity. The site was settled in 1751. In July, 1863, the town was shelled by the Confederates. Pop. (1910) 10,303.

Carlisle, Frederick Howard, Fifth Earl of (1748–1825), English politician; was president of the Board of Trade (1779), and viceroy of Ireland (1780–2). In 1778 he was sent to America by Lord North as chief of the commission to treat with the American colonies. He wrote a tragedy, *The Father's Revenge* (1783), which was warmly praised by Johnson and Walpole. He published *Tragedies and Poems* (1801). He was guardian in Chancery to Lord Byron, and was attacked in the latter's *English Bards and Scotch Reviewers*.

Carlisle, George William Frederick Howard, Seventh Earl of (1802–64), English politician, born in London; was a supporter of the Reform Bill, and represented (1831–41) the West Riding in the first reformed Parliament. He became Chief Secretary for Ireland (1835–41), and passed the Irish Tithe, Irish Municipal Reform, and Poor Law Bills. He visited the United States in 1841–2. In 1848 he succeeded to the earldom, and took his seat in the House of Lords (1849). He was twice appointed lord-lieutenant of Ireland (1855–8 and 1859–64), and devoted himself during his terms of office to the improvement of Irish agriculture and manufactures.

Carlisle, John Griffin (1835–1910), American lawyer and legislator, was born in Campbell County, Ky. He received a meagre common school education, most of his youth being spent in assisting his father, a farmer. In 1858 he was admitted to the bar, and, though he soon became a successful lawyer, he devoted his attention chiefly to politics. He was a member of the lower house of the Kentucky legislature (1859–61) and of the State senate (1866–71); and was lieutenant-governor of Kentucky (1871–5). After twenty years of political influence in his native State, he was elected a Democratic Representative in Congress, a position which he held until 1890, being for six years (1883–9) Speaker of the House of Representatives. He was a prominent advocate of the repeal of the Silver Purchase Act and of the reduction of the tariff; and, as Speaker, was noted for the judicial fairness of his decisions on parliamentary law. He was a member of the U. S. Senate (1890–3), and Secretary of the Treasury in the Cabinet of President Cleveland (1893–7). During these years he succeeded in averting grave dangers that threatened as the result of the Silver Purchase Act and the depletion of the Treasury in the previous administration. In the 'free-silver campaign' of 1896 a movement was started to nominate Carlisle for President, but he declined to be considered a candidate, and supported the candidates of the 'Gold Democrats.' He also refused an appointment from Cleveland as Chief Justice of the Supreme Court. In 1897 he retired from public life, and removed to New York City to engage in the practice of law.

Carlists, the supporters of the Legitimist pretender to the throne of Spain. In 1713 Philip V., the first of the Bourbon dynasty, settled the royal succession by a statute in favor of male heirs. His successor, Ferdinand VII., in 1830, was persuaded by his fourth wife, Christina of Naples, to issue a decree abrogating this statute. A daughter was born the same year, who thus became the heir to the throne in place of the King's brother, Don Carlos. The latter had many ardent supporters, especially in the Basque provinces, and on Ferdinand's death (1833) he quickly secured all the north of Spain by force of arms, and his success was only cut short when Christina obtained the aid of Great Britain and France. Don Carlos finally resigned his pretensions to his son, Don Carlos 2d, in 1845; the latter, in 1861, to his brother, Don Juan; and the last named, in 1868, to his son, Don Carlos 3d, who was afterward accepted by the extreme French Legitimists also as their recognized head. In 1867 he married Princess Margaret of Bourbon, daughter of Duke Carlos III. of Parma, and in 1894 Marie Berthe, Princess de Rohan. He died in July, 1909.

After the first Carlist war, many risings took place, but the most formidable occurred in 1873, when the abdication of King Amadeo and the proclamation of a republic afforded an opportunity. This, the second Carlist war, was only suppressed in 1876, after which the Basque provinces were deprived of the last of their autonomous privileges.

Don Carlos 3d's eldest son, Don Jaimé, born in 1870, is an officer in the Russian Army. He announced at the time of the Moroccan trouble, in 1909, that he would not attempt to gain the Spanish throne by force. In 1910, however, he offered to aid the Pope in the dispute between the Government and the Vatican, and another uprising may occur at any moment. See Spain.

Carlos I. (1863–1908), king of Portugal, son of Luiz I., was born in Lisbon, and ascended the throne in 1889. During his reign Portugal rose in international importance through the activity of colonization in Africa. But the country was in financial difficulties, accumulated from the beginning of the century; and despite the fact that the king and his family surrendered a fifth of their income to meet public needs, the financial situation caused the growth of a strong radical sentiment among the people. In 1893 an attempt was made on the king's life, and in 1908 he and Crown Prince Luiz were assassinated while driving in the capital. See Portugal.

Carlos, Don (1545–68), the son of Philip II. of Spain, was of vicious character and feeble intellect, and was deprived by his father of the right of succession in favor of the Archduke Rudolf. His betrothal to Elizabeth of Valois, daughter of Henry II. of France, was abruptly annulled by his father intervening and himself marrying Elizabeth. In 1567 he was accused, on a statement made under confession, of plotting his father's murder, though it is more probable that the intended victim, who had not been named, was the Duke of Alva. The death of Don Carlos in the following year was attributed by William of Orange to his father's orders. The true cause is uncertain, but the version of the story given in Schiller's famous tragedy, *Don Carlos*, must be rejected as fiction. In addition to Schiller, Chénier, Alfieri, and Otway have made him the subject of dramas. See Gachard's *Don Carlos et Philippe II.* (1863); Prescott's *Philip II.* (1856).

Carlota, inland town of Occidental Negros, Philippine Islands. It is a telegraph and military station and an important road centre between interior points and the coast. Pop. 13,500.

Carlotta (Marie Charlotte Amélie) (1840), ex-empress of Mexico, the wife of Archduke Maximilian of Austria, and the only daughter of Leopold I. of Belgium, was born in Laeken, Belgium. She was married to Maximilian in 1857, and accompanied her husband to Mexico in 1864, whither they went on invitation from the Assembly of Notables, at the suggestion of Napoleon III. In 1866 she returned to Europe to secure aid for her husband from Napoleon III. of France. Failing in this, she appealed without result to the Pope. Her health was much affected; and after the complete failure of the Mexican enterprise, and the execution of Maximilian, her mind gave way. She was placed in the care of her family, first at the royal Belgian palace at Laeken, and afterward at a royal château near Brussels. See Maximilian.

Carlovingians, more correctly Carolings, the second reigning dynasty of France. The family dates from Arnulph, bishop of

Metz, in the seventh century. Arnulph's grandson, Pepin, or Pippin, Duke of Austrasia, became mayor of the palace under the Merovingian kings. On Pepin's death (714), Charles Martel (q.v.), natural son of Pepin, usurped the position, and by the victory of Poitiers (732) over the Saracens, which saved France from the fate of Spain, and by wise administration strengthened his position so much that he became actual ruler, though content with the title of Duke of France. Charles's son, Pepin (le Bref), in league with Pope Zachary, deposed Childeric, last of the Merovingians, and was crowned in 752. He was succeeded in 768 by his son, Charlemagne (q.v.), who widely extended the empire. On the death of Charlemagne's son, Louis (814–840), the empire was divided among his three sons—*viz.*, Louis (Germany), Lothaire (Italy, Lorraine, and Burgundy), and Charles ii., the Bald (France). Charles ii. died in 877, and was followed by a succession of feeble princes, the Carlovingian dynasty ending with Louis v. in 987, when the Capets began their reign. Consult Warnköning and Gerard's *Histoire des Carolingiens* (2 vols., 1862); and for the copious literature of the period, Monod's *Bibliographie de l'Histoire de France* (1888). See France, *History;* Holy Roman Empire.

Carlow, county, province of Leinster, Ireland. The Leinster (2,604 ft.) and other mountains border it on the southeast, but the greater part of the surface is level or undulating. The principal rivers are the Barrow and the Slaney. The soil is generally fertile, and agriculture is the chief industry. Area, 221,224 ac. Pop. 38,000.

Carlow, chief town of above county. St. Patrick's College was founded in 1795. Slight vestiges remain of the ancient castle, which dates from 1180. Pop. 6,500.

Carlsbad, town, capital of Eddy co., New Mexico, on the Pecos River, and on the Pecos Valley and Northeastern and the Pecos and North Texas RRs. It manufactures beer and ice, and acts as a distributing centre for live stock and wool. Pop. (1910) 3,000.

Carlsbad, Carlsruhe, Carlstad, etc. See Karlsbad, Karlsruhe, Karlstad, etc.

Carlstadt, town in Bergen co., New Jersey, on the Erie RR.; 9 m. northwest of Jersey City. Its industries include silk mills and white goods factories, and marble works. Pop. (1910) 3,807.

Carlstadt, Andreas Rudolf Bodenstein af (1483–1541), German theologian, born at Karlstadt in Franconia; studied theology at Wittenberg, where he became pastor (1508) and professor (1515). He was a reformer of the most extreme stamp, outstripping Luther, with whom he held controversy. He denied the real Presence, and was a bitter opponent of images. Compelled to flee (1528) from Saxony, he found shelter in Switzerland, where he remained until his death, being appointed (1534) professor of theology at Basel.

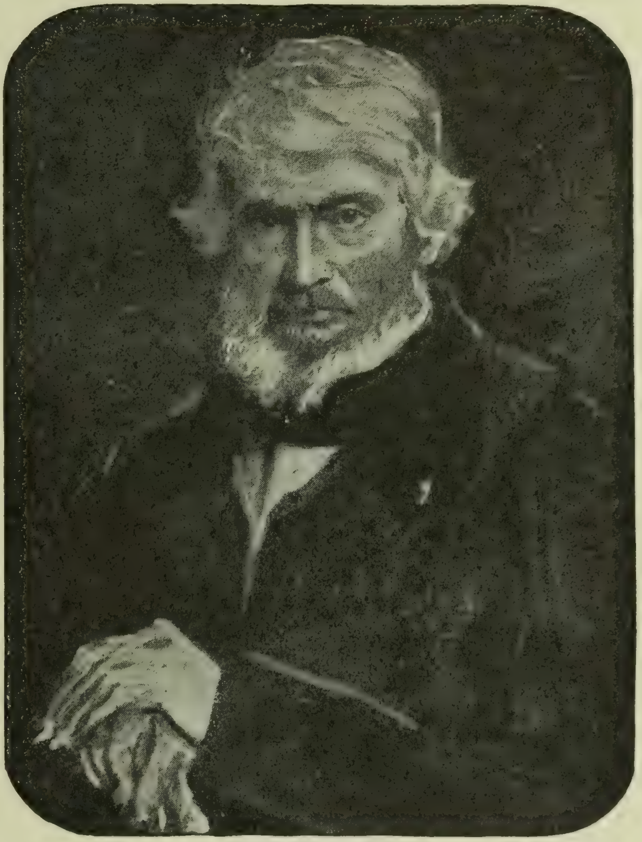
Carlyle, Jane Baillie Welsh (1801–66), wife of Thomas Carlyle, was born at Haddington and claimed descent from John Knox and Sir William Wallace. Her earliest teacher was Edward Irving, by whom she was introduced to Carlyle in 1821; and the friendship with the new acquaintance ripened gradually into affection. The marriage took place on Oct. 17, 1826. The Carlyles first resided at Comely Bank, Edinburgh, removing in 1829 to Craigenputtock, and in 1834 to Chelsea. (See Carlyle, Thomas.) Much has been made of the unhappiness of her married life, and it is evident that her husband might have made it easier if he had recognized her intellectual powers by consulting her more in regard to his work. Part of her unhappiness was also due to jealousy of Lady Ashburton's friendship with her husband (from about 1847 to 1857). But it is difficult to see how two people of such exaggerated nervous sensibility could ever have been happy in the ordinary sense; although the later letters of the two show the warmest affection on both sides. From about 1842 (the year of her mother's death) Mrs. Carlyle was really a perpetual invalid, being tortured with unceasing attacks of neuralgia. In 1863 she had a bad fall in saving herself from being run over by a cab in the street, and was seriously injured. She rallied, however, and the pain of her disease even lessened; but on April 21, 1866, she was found dead in her carriage as she was driving in Hyde Park. Mrs. Carlyle wrote some poetry of more than ordinary merit, and her posthumously-published letters mark her out as among the first letter-writers in the language. See *Letters and Memorials of Jane Welsh Carlyle*, ed. by J. A. Froude (1883); *Early Letters of Jane Welsh Carlyle*, ed. by D. G. Ritchie (1889); *Life of Jane Welsh Carlyle*,by Mrs. Alexander Ireland (1891). The recently re-opened Carlyle controversy may be sufficiently studied in the *New Letters and Memorials of Jane Welsh Carlyle*, ed. by Alexander Carlyle, with an introduction by Sir James Crichton-Browne (1903); *My Relations with Carlyle*, by J. A. Froude (1903); and Sir J. Crichton-Browne's article, 'Carlyle and Froude,' in the *Contemporary Review* for July, 1903.

Carlyle, John Aitken (1801–79), younger brother of Thomas Carlyle, was born at Ecclefechan, Dumfriesshire, Scotland. Failing to build up a medical practice in London, he became a travelling physician. He executed an admirable translation of Dante's *Divine Comedy*, published in 1849 (2nd ed. 1867). In 1861 he edited Dr. Irving's *Hist. of Scottish Poetry*. He died at Dumfries. See Carlyle's *Reminiscences* (1881), and *Letters, etc., of Jane Welsh Carlyle* (1883).

Carlyle, Thomas (1795–1881), Scottish historian and moral teacher, was born (Dec. 4) at Ecclefechan, Dumfriesshire. His father, James Carlyle (1757–1832), a stonemason, was twice married, and Thomas was the first-born of his second wife, Janet Aitken (1769–1853). From Annan Academy he proceeded to Edinburgh University, where he matriculated in November, 1809. Carlyle had been intended for the ministry of the Church of Scotland, but after much hesitation he finally abandoned the purpose in March 1817. Previous to this (1814) he had become mathematical master at Annan Academy, and had removed in 1816 to Kirkcaldy. His opponent here was Edward Irving, but the intercourse between the two was, thanks mainly to Irving's frankness, of the most cordial description; and through him Carlyle made the acquaintance of Margaret Gordon (the Blumine of *Sartor Resartus*), who afterwards became Lady Bannerman. He left Kirkcaldy in November, 1818, and removed to Edinburgh, where he subsisted by private teaching, translating scientific articles, and doing biographical and geographical work for Brewster's *Edinburgh Encyclopædia.* Life was made miserable for him by his lifelong foe dyspepsia, and also by doubt in religious matters. From this latter trouble he was relieved by his sudden 'spiritual new birth' which, he tells us, happened in June, 1821, as he was passing down Leith Walk; and an engagement as tutor to the sons of Mr. Buller, a retired Anglo-Indian, relieved him from pecuniary cares.

In 1824 he published a translation of Goethe's *Wilhelm Meister;* and this, with his *Life of Schiller*, which first appeared (1823–4) in the *London Magazine*, and was published in book form in 1825, led to his long correspondence with Goethe. His tutorship with the Bullers was resigned in 1824, during a visit to London. In 1826 he married Jane Baillie Welsh (see Carlyle, Jane Baillie Welsh), and settled down at 21 Comely Bank, Edinburgh. Next year he published four volumes of translations entitled *German Romance;* and he began to write for the *Edinburgh Review*, having obtained an introduction to Jeffrey through Barry Cornwall. His connection with the *Edinburgh* led to the production of that great series of essays beginning with the one on Richter—essays more marked by psychological than by critical insight. At the same time Carlyle also wrote in the newly-established *Foreign Review*, and a connection with *Fraser's Magazine* followed in 1830. He now formed a new plan of removing to his wife's property at Craigenputtock, which his brother Alexander was to farm; and this plan was carried out in 1829, much to Mrs. Carlyle's discomfort. In the solitude of Craigenputtock Carlyle first found himself. Here his most characteristic work, *Sartor Resartus*, was written, and the *French Revolution* planned. And here, in 1833, he received a visit from Ralph Waldo Emerson. A *History of German Literature* was also embarked on, but never completed. But in 1830, his brother's farming of Craigenputtock having proved a failure, the little household was in sore financial straits. *Sartor* was now at length (1833–34) appearing in *Fraser's*, and in June, 1834, the Carlyle household moved to London, establishing themselves at No. 5 (later 24) Cheyne Row, Chelsea. By May, 1836, the first volume of the *French Revolution* was complete in MS.; but having been lent to John Stuart Mill it was burnt by his housemaid. However, the volume was recreated by September; and the complete work appeared in 1837, being received with enthusiasm. On the suggestion of Miss Martineau, Carlyle delivered a course of lectures on German Literature (May, 1837), followed by courses on European Culture, Revolution of Modern Europe, and Heroes and Hero-worship (1838–40). *Sartor Resartus* appeared in book form in the U. S. (1836), under the protection of Emerson, and now reappeared in England (1838). New works also were produced in fairly rapid succession. *Critical and Miscellaneous Essays* and the pamphlet *Chartism* came out in 1839, followed by the printed lectures on *Hero-worship* (1841), *Past and Present* (1843), *The Letters and Speeches of Oliver Cromwell* (1845), *Latter-day Pamphlets* (1850), and the life of his friend *John Sterling* (1851), a work which contains much of his most vivid descriptions of men and scenes. His last great work, the *History of Frederick the Great*, was begun in 1852, and occupied him for thirteen years, during which he made two visits to Germany (1852 and 1858). It appeared in instalments of two volumes in 1858, 1862, and 1865. One of the most regrettable incidents of his life was the writing in 1863 of the paper, entitled *The American Iliad in a Nutshell*, a violent attack on the anti-slavery side in the American civil war; and the bequest to Harvard University after his death of the books used in the composition of *Frederick* and *Cromwell* was undoubtedly designed as a reparation for the wrong done on this occasion. On the 21st of April, 1866, his wife died; and his whole after-life was saddened by the discovery, from her letters and journals, how unhappy her life had been. He visited Mentone in 1867, and began the writing of his *Reminiscences* (published by his literary executor, Froude, in 1881). The franchise legislation of 1867 produced his *Shooting Niagara*, which appeared (August, 1867) in *Macmillan's Magazine.* His latest works of any length, *Early Kings of Norway* and *Portraits of John Knox*, appeared in *Fraser's Magazine* for January, and March, 1875. He was buried at Ecclefechan.

Carlyle was in perpetual opposition to the main tendencies of his own age. He preached the benefits of benevolent despotism to a generation whose main political work was the development of democratic principles; and to an age of easy optimism, bred of unparalleled commercial activity, he proclaimed the doctrine that wealth is not prosperity, and only brings new dangers instead of removing the old. This perpetual opposition, which made him such a healthy stimulus to his first readers, however, is apt to militate against him with their successors. The defects of his method—his habitual exaggeration, his exaltation of the individual at the expense of the



Thomas Carlyle.

(From the unfinished portrait by Millais in the National Portrait Gallery, London.)

people, and the great preponderance of destructive criticism in his works—rather repel readers of to-day. But his doctrine of the sacredness of work and the sacredness of truth, have already passed into the current thought of our time. As a literary artist, as a painter of individuals and individual scenes in biography and history, he is unrivalled among the prose writers of the world. The style of his earliest works is little different from that of ordinary compositions of the preceding generation; but as his genius developed he forged for himself a new style, unfettered by any of the ordinary conventions, and, for the most part, running counter to them. In Carlyle's hands it became the most perfect example literature offers of the unconscious self-revelation of a great personality.

See J. A. Froude's *Thomas Carlyle: a History of the First Forty Years of his Life* (1882), and his *Thomas Carlyle: a History of his Life in London* (1884); also *Carlyle's Reminiscences*, edited by Froude (1881) and by Professor Norton (1887). Norton has also edited *The Correspondence of Thomas Carlyle and Ralph Waldo Emerson* (1883; revised edition, 1886), *Early Letters of Thomas Carlyle* (1886), and *Correspondence between Goethe and Carlyle* (1887). Of other books dealing with Carlyle's life, we may mention Moncure D. Conway's *Thomas Carlyle* (1881); R. H. Shepherd's *Memoirs of the Life and Writings of Thomas Carlyle* (1881), and *The Bibliography of Carlyle* (1881); W. H. Wyllie's *Thomas Carlyle, the Man and his Books* (1881); Professor Masson's *Carlyle Personally and in his Works* (1885); H. Larkin's *Carlyle and the Open Secret of his Life* (1886); and *Lives* by R. Garnett (1887), Paxton Hood (1875), H. J. Nicoll (new ed. 1894), and Wilson's *Froude and Carlyle* (1898). Interesting critical notices may also be found in Morley's *Critical Miscellanies*, vol. i.; W. Minto's *Manual of English Prose Literature* (3rd ed. 1886); *The Life and Writings of Joseph Mazzini* (1864–70; see vol. iv.); Matthew Arnold's *Discourses in America* (new ed. 1896); and Augustine Birrell's *Obiter Dicta* (new ed. 1896).

Carmagnola, tn., prov. Turin, Italy, 18 m. by rail S. of Turin; has silk industries. Pop. (1901) 11,721.

Carmagnola, FRANCESCO DI BARTOLOMMEO BUSSONE (*c.* 1390–1432), Italian condottiere, was the son of a peasant of Carmagnola (Piedmont), whence his surname. He entered in 1412 the service of Visconti, Duke of Milan, and not only established the power of Visconti in Milan, but also conquered Bergamo, Brescia, Parma, Novara, Piacenza, Genoa, etc. But losing the confidence of his prince through court intrigues, he transferred his services (1425) to Venice, which entrusted him with the command of the expedition against the Duke of Milan. Having won a victory at Maclodio in 1427, he conquered (1428) Bergamo and a part of Cremona, and forced Visconti to make an unfavorable peace. Being suspected of treachery by the Venetian senate, he was enticed into the Doge's palace, separated from his suite, tortured, and executed in the Piazza, in 1432. The fate of Carmagnola, a typical mercenary leader of the 15th century, forms the subject of several dramas and novels, the best being Manzoni's tragedy *Il Conte di Carmagnola* (1820). See Daru's *Histoire de Venise* (1821); Battistella's *Il Conte Carmagnola* (1889).

Carmagnole. **(1.)** A vest adorned with several rows of buttons, popular in the south of France, and much worn by ardent revolutionists during the troublous times. **(2.)** A revolutionary song and dance which was the rage in Paris in 1792 and following years. Each verse ended with this refrain—

> 'Dansons la Carmagnole, vive le son,
> vive le son,—
> Dansons la Carmagnole, vive le son
> du canon!'

Carman (WILLIAM) BLISS (1861), Canadian poet, was born at Fredericton, New Brunswick, and graduated (1881) at the University of New Brunswick. He continued his studies in Edinburgh and at Harvard, studied for the law, practiced engineering, and engaged in various journalistic enterprises. He was office-editor of the *Independent*, 1890–2, and was for some time editor of the *Literary World*. His first book, *Low Tide on Grand Pré* (1893) showed that dreamy appreciation of the spirit of Canadian woods and waters that is characteristic of his best verse. It was followed by *A Sea Mark* (1895), *Behind the Arras* (1895), *Ballads of Lost Haven* (1897), *By the Aurelian Wall* (1898), *Pipes of Pan* (5 vols., 1902–5), *Collected Poems* (1905); and two volumes of essays—*The Kinship of Nature* (1903) and *The Friendship of Art* (1904). *Songs from Vagabondia* (3 vols., 1894–1900) were written in collaboration with Richard Hovey.

Carmarthen, co. tn. and bor. on the river Towy, 8 m. from the sea, Carmarthenshire, Wales; has important fairs, and iron-founding, woollen manufacture, tanning, and rope-making industries. It has a theological college and training college. Pop. (1911) 10,221.

Carmarthenshire, a maritime co. of S. Wales, on the Bristol Channel. The surface is generally hilly, intersected by narrow valleys. The principal level tract is that of the Vale of Towy, extending inland for about 30 m. The soil is generally fertile in the valleys, more particularly those of the three chief rivers, the Towy, the Taf, and the Teifi, but throughout a great part of the hilly and mountainous districts it is poor. Sheep are reared in considerable numbers, besides cattle and horses. The mineral resources are important: coal takes the lead, with an annual output exceeding 1,000,000 tons; limestone and sandstone are extensively quarried; fire and other clays, slate, and lead are also worked. Chief town, Carmarthen. Near Llandilo was fought, about 1277, one of the last battles in which Edward I. destroyed the independence of Wales. In 1843 the inhabitants took a very active share in the Rebecca riots. The county is very rich in antiquarian remains. Area of county (ancient and admin.), 918 sq. m. Pop. (1911) 160,430.

Carmaux, tn., dep. Tarn, France, 9 m. by rail N. of Albi, is the centre of a coal-mining district. There are glass works and brick works. Pop. (1901) 10,956.

Carmel. **(1.)** a town of Palestine, in Judah, 10 m. S.E. of Hebron; now Kurmul. **(2.)** Mt. Carmel, a long hill (1,700 ft.) in N.W. Palestine, terminating in a bold headland (500 ft.) on the Mediterranean; now Jebel Mar Elyas (*i.e.* Elijah) or Kurmul. Mt. Carmel is immemorially famous as a place of great sacredness, and here Elijah triumphed over the priests of Baal (1 Kings 18: 17 *f.*); the Druses also have a sanctuary on the supposed site of his altar. In Roman times it was noted as the place of an oracle; and the Carmelite Friars, who derive their name from it, have a convent upon the promontory. At its foot is the prosperous German Templar colony of Haifa. **(3.)** Tn., N. Y., co. seat of Putnam co., 50 m. N.N.E. of New York, on the N. Y. C. and H. R. R. R. It is the seat of Drew Seminary and Female College. Gleneida Lake is situated here, and Lake Mahopac, a summer resort, is 4 m. to the S.W. Pop. of the town (1910) 2,610.

Carmelites, or ORDER OF OUR LADY OF MOUNT CARMEL, popularly known in former times as 'White Friars.' Although this order was practically founded in 1156 by an Italian monk and ex-crusader, Berthold, on Mt. Carmel, it was nevertheless believed by many that a succession of holy men had lived the anchoritic life there from the time of Elijah; and these conflicting beliefs culminated in the seventeenth century in a bitter controversy, eventually silenced by a Papal edict of 1698. After 1238 the Mohammedans caused the Carmelites to leave Mount Carmel, and they settled in various European countries. The ascetic rule prescribed to the twelfth-century hermits of Mount Carmel underwent much modification after the migration to Europe, notably under Innocent IV. (1245) and Eugenius IV. (1431), and the Carmelites became altered from hermits into mendicant friars. At the same time they flourished greatly, possessing no less than fifty-two houses in England at the date of the dissolution of the monasteries. To-day, there are Carmelite houses in America, England, Ireland, and Spain.

The order of *Carmelitesses*, or *Carmelite Nuns*, was instituted by the Carmelite general Soreth in 1452.

Carmen, seaport, Campeche state, Mexico, capital of the district, and situated on the island of the same name which encloses one side of Laguna de Términos. Dyewood is exported. Pop. 6,000.

Carmen, town, Antioquía, Colombia, 60 miles southeast of Cartagena; noted for its tobacco. Pop. 10,000.

Carmen Sylva. See ELIZABETH, QUEEN OF ROUMANIA.

Carmi, city, Illinois, county seat of White county, at the head of navigation on the Little Wabash River, and on the Cairo branch of the Cleveland, Cincinnati, Chicago, and St. Louis, and the Louisville and Nashville Railroads. Its manufactures include bricks, tiles, and flour. Fruit and grain from the surrounding agricultural region are exported. Pop. (1900) 2,939; (1910) 2,833.

Carmignano, market town, Tuscany, Italy, 13 miles northwest of Florence. It exports wines (Montalbiolo) and manufactures straw hats. Pop. 14,000.

Carmina Burana, songs, mostly Latin, some also German, written in the twelfth and thirteenth centuries by wandering students (Goliards). They are similar in form to the church hymns, and their subjects, though mostly of a religious character, sometimes turn also on profane and even immoral matters. A complete collection has been edited by Schmeller. Compare MACARONIC VERSE.

Carminatives, a class of remedies used in medicine for the relief of gastric and intestinal discomfort, caused by the collection of gases formed during imperfect digestion. Carminatives also stimulate the nervous system generally, and through it the heart and circulation. Anise, caraway, cardamom, cajuput, chalk, cinnamon, cloves, coriander, dill, fennel, ginger, juniper, lavender, lime water, nutmeg, peppermint, spearmint, and sodium carbonate are the most familiar examples.

Carmine, a beautiful red coloring substance obtained from the cochineal insect. The powdered cochineal is boiled with water (as pure as possible) in the proportion of from four to eight gallons of water to each pound of powder. To the solution is added alum, which precipitates the coloring matter as a lake. See COCHINEAL; DYEING.

Carmo. See KARMÖ.

Carmona, town, province of Seville, Spain; 18 miles northeast of Seville. It is a very ancient Iberian, Roman, and Moorish town, picturesquely situated commanding an imposing view of the valley of the Guadalquiver. It has many Roman and Moorish remains including a Roman necropolis of great interest, and considerable portions of the Moorish wall and alcazar. Pop. 20,000.

Carnac, a Breton village, department of Morbihan, France, on the Quiberon peninsula; 17 miles southeast of Lorient. It is famous for the number and variety of its Celtic monuments and Gallo-Roman ruins, consisting of menhirs, dolmens, and tumuli, with which the neighborhood is studded. The principal group of menhirs is situated on a sterile moor near the seashore, and consists of 1991 rude monoliths of granite. They are arranged in eleven roughly parallel rows, with two slight breaks, extend from east to west, about a mile and a quarter in length, and have at one end a curved row of eighteen stones, the extremities of which touch the outer horizontal rows. The bossenno, a group of mounds, about a mile and a half from Carnac, otherwise called 'Cæsar's Camp,' contains the principal Roman remains, and was first explored systematically by James Miln of Scotland. Consult Miln's *Excavations at Carnac* (1874–80).

Carnallite ($KClMgCl_2 6H_2O$) is a double chloride of potassium and magnesium, forming a valuable source of these metals, and found in considerable quantities at Stassfurt in Prussia. See POTASSIUM.

Carnarvon, or CAERNARVON, seaport town, capital of Carnarvonshire, Wales, is situated near the southern end of Menai Strait; 69 miles west of Chester. There are remains of the ancient walls, and the castle, commenced by Edward I. in 1283, is one of the noblest ruins in Great Britain, its walls, which are 7 to 9 feet thick, being still entire. Industries are shipbuilding, fishing, and tanning. There are also iron and brass foundries; and slates, stones and ores are exported. The town is popular as a bathing resort and is much frequented by tourists. Carnarvon was an old Roman station, and a residence of early Welsh princes; Edward II. was born in the castle (April 25, 1284). Pop. (1911) 9,119.

Carnarvon, district and town, Cape of Good Hope; 102 miles northwest of Beaufort West. It is famed for the vast reservoir known as Van Wyk's Vlee. Pop. of district, 7,000; of town, 1,000.

Carnarvon, HENRY HOWARD MOLYNEUX HERBERT, FOURTH EARL OF (1831–90), English public official, was born in London. He became Colonial Secretary in the Conservative Cabinet of 1866, but resigned because of his opposition to the Reform Bill of 1867. In Disraeli's government (1874) he resumed the portfolio of Colonial Secretary, which he held till 1878. In 1885 he became lord-lieutenant of Ireland. He wrote *The Druses of Mount Lebanon* (1860), *Reminiscences of Athens and the Morea* (1869), and translated the *Agamemnon* (1879), the *Odyssey* (1886), and the *Prometheus Vinctus* (1893).

Carnarvonshire, the most northwesterly county in the mainland of Wales, is separated from Anglesey by the Menai Strait. It comprises two natural divisions, the north mountainous region, or Snowdonia, and the south peninsula, or Lleyn promontory, mostly level or undulating. The coast of the north forms the fine rocky headlands of Great Orme's Head and Penmaenmawr; on the Menai Strait it is rugged, and in the south generally low. Snowdon proper, with Yr Wyddfa or the Peak, 3,560 ft., is the highest summit of England and Wales (see SNOWDON). The principal rivers are the Conway, with its tributary the Llugwy; Ogwen, with Nant Francon and Seiont, and Glaslyn. Much of the surface is unfit for cultivation. The rearing of sheep and other stock and dairying are the principal branches of farming industry. Of minerals, slate is the most valuable, drawn mostly from the quarries of Penrhyn; copper is worked at Beddgelert. Area, 563 square miles. Pop. (1911) 141,776.

Carnassial or SECTORIAL TEETH are teeth specially adapted for tearing flesh, and are peculiar to the terrestrial carnivora. In the typical carnivores there is one carnassial tooth at each side in each jaw. In the upper jaw it is the last premolar which forms the carnassial; in the lower, the first molar. In shape the upper and lower carnassials differ from each other, but both have compressed blades, divided into sharp-edged cusps, and are large relatively to the other teeth.

Carnatic, a region on the eastern or Coromandel coast of India, now included in the presidency of Madras.

Carnation (*Dianthus caryophyllus*), a double flowering variety of the clove pink, is a half hardy herbaceous, perennial plant, a native of Southern Europe, having been cultivated by the ancient Greeks and Romans.

Carnations.

The plant is from two to three feet high, with a branching stem, opposite linear leaves, and terminal flowers which bloom naturally in summer, and are cultivated under glass throughout the year. Until the sixteenth century only one variety, pale pink in color, was known, but carnations of many forms and colors are now cultivated, the most common being white, pink, and red. The carnation is best grown from cuttings taken from blooming stock, the finest ones being those taken from the middle of the plant. These cuttings are placed in moist sand and protected from sun and drafts; in about four weeks they are ready for potting, and in late April or early May they are planted out of doors. The soil should be a sandy loam; sheep manure, dried blood, and wood ashes are good fertilizers. Abundant fresh air and a cool steady temperature are essential to successful cultivation.

The tree or perpetual-blooming carnations which have been brought to a high state of perfection by American growers are widely used for providing flowers in the depth of winter. Cuttings are taken in August, potted, and wintered under glass. They are not allowed to flower during the following summer, but are gradually moved on into bigger pots. In September they are placed under glass, and kept at a temperature of from 50° to 65° F.

The chief diseases to guard against are stem rot, caused by a fungus in the soil; carnation-rust, also caused by a fungus, and fairy ring, due to a humid or foul atmosphere. Spraying with Bordeaux mixture is effective in all cases.

Carnauba (*Copernicia cerifera*), a Brazilian palm, the under surface of the leaves of which yields a wax used to adulterate beeswax, in the manufacture of candles, etc. The timber is used for veneering, the fruit is edible, and the leaf is woven into mats, hats, baskets, etc.

Carneades (*c.* 213–129 B.C) of Cyrene, in Africa, Greek philosopher. He studied logic at Athens under Diogenes, but became a partisan of the New Academy, and an enemy of the Stoics, whose stern and almost dogmatic ethics did not suit his skeptical predilections.

Carnedd Dafydd and **Carnedd Llewelyn.** See SNOWDON.

Carnegie, borough, Allegheny county, Pennsylvania, on the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Pittsburgh, Chartiers, and Youghiogheny Railroads; 5 miles southwest of Pittsburgh. It has large iron and steel works, and manufactures of tin, lead, and agricultural implements. Pop.(1900) 7,330; (1910) 10,009.

Carnegie, ANDREW (1835–1919), American manufacturer and philanthropist, was born in Dunfermline, Scotland, on Nov. 25, 1835. In 1848 his parents came to America, and settled in Allegheny City. Andrew was employed first as a 'bobbin boy' at a dollar and twenty cents a week, and then entered the service of the Ohio Telegraph Company as a messenger boy, learned telegraphy, and became an operator on the Pennsylvania Railroad. He was promoted to the office of secretary to the superintendent, and in 1860 became superintendent of the Pittsburg division of the railroad, a position he held until shortly after the Civil War. When war seemed imminent, he was called to Washington and organized the Military Telegraph Corps. During the war he performed important duties as superintendent of military railways and government telegraph lines in the East.

Meanwhile, his business activities were not confined to his salaried positions. In 1854 he made his first investment—ten shares of Adams Express Company Stock—with money borrowed from his uncle. He also saw the advantages of the sleeping car, then newly invented; invested money in the Woodruff Sleeping Car Company, and obtained the adoption of the system on the Pennsylvania. On the discovery of oil in Pennsylvania, in 1861, he invested his dividends and savings in oil lands, which yielded a large profit. He also became interested in the Iron City Forge Company and the Keystone Bridge Company. In 1868 he visited England and investigated the Bessemer steel processes, and on his return broke new ground by founding the Union Mills, Pittsburgh, for the manufacture of steel rails. The subsequent boom in railroad building brought great success to his iron and steel enterprises, and he built the Edgar Thomson Steel Works.

In 1875 all the concerns in which Carnegie was interested were amalgamated under the title of 'Carnegie Brothers & Co.' In 1883 the Homestead Steel Works were acquired, and along with several other works were formed into one concern under the title, 'The Carnegie Steel Company Limited'; capital (paid up), $25,000,000. In 1892 the Frick Coke Company was amalgamated with it, and the company's capital raised to $60,000,000, to be still further increased to $140,000,000 in 1900; while in 1901 the entire Carnegie enterprise was taken over by the United States Steel Corporation, Mr. Carnegie retiring from active business with an interest in the company amounting to $250,000,000.

Besides his beautiful Fifth Avenue residence in New York City, Mr. Carnegie had a magnificent home in Scotland—Skibo Castle—where he spent a large portion of the later years of his life. He died suddenly after a short illness with pneumonia, at his summer home at Lenox, Mass., on August 11, 1919.

The philanthropic works of Andrew Carnegie are famed throughout the world, his numerous benefactions being estimated at over $350,695,000. He expended on 2,811 libraries, located in all parts of the world, the sum of $60,364,808. To the Scottish universities, for the payment of class fees for the students, he in 1901 gave $10,000,000. He presented a technical school and large public park to Dunfermline, and was a generous helper of the University of Pennsylvania, the Pittsburgh Technical School, the Mechanic's and Tradesman's School of New York, the Cooper Union technical classes, and other institutions. He contributed large sums to the Carnegie Institution, the Carnegie Institute, the Carnegie Hero Funds, and the Carnegie Endowment for International Peace (qq. v.) He gave also $1,500,000 for the erection of the Peace Palace at The Hague (q. v.). In April, 1907, he presided at the Peace Conference held in New York, and the same year gave $750,000 to house the Bureau of American Republics in Washington. In 1912 he gave $125,000,000 to the Carnegie Corporation of New York, which was organized to carry on work in which he was interested. To the Allied Engineers' Societies he gave $1,500,000; while his gifts to small colleges in the United States amounted to some $18,000,000 and his war benefactions, including gifts to the Red Cross, totalled over $2,790,000. At his death his estate was valued at between $25,000,000 and $30,000,000, of which $20,000,000 was left to the Carnegie Corporation.

Mr. Carnegie's writings include *An American Four-in-Hand in Britain* (1883); *Round the World* (1884); *Triumphant Democracy* (1886); *The Gospel of Wealth* (1900); *The Empire of Business* (1902); *Life of James Watt* (1905); *Problems of To-Day* (1908).

Carnegie Endowment for International Peace, a foundation of $10,000,000 given by Andrew Carnegie (q. v.) in 1910 for the promotion of international peace. Its object, as outlined by the trustees (twenty-eight in number) at their first meeting, in March, 1911, is to advance the cause of peace among nations, to hasten the abolition of international war, and to encourage and promote a peaceful settlement of international differences. These objects are to be attained by promoting investigations as to the cause of war and practical methods of avoiding and preventing it; by diffusing information; by educating public opinion; by establishing a better understanding of international rights and duties; by cultivating friendly knowledge and understanding between different countries, and by maintaining, promoting, and assisting all associations and agencies that shall be deemed necessary and useful in attaining the purposes of the corporation. The work of the Endowment is divided into three parts: the division of Intercourse and Education, the division of International Law, and the division of Economics and History.

The outbreak of the European War in 1914 necessarily caused many changes in the plans of the Foundation. A resolution was passed in support of vigorous prosecution of the war as the most effectual means of promoting durable international peace; and the Trustees voted to tender the services of its officers and personnel to the Secretary of State during the continuance of the war. This offer was accepted, special appropriations were made for the purpose, and a large volume of work undertaken at the request of the Secretary of State was sent to the Paris Peace Conference, for use in the preparation of the Peace Treaty.

Senator Elihu Root is president of the Board of Trustees. Headquarters are in Washington and meetings of the trustees are held annually in April.

Carnegie Foundation for the Advancement of Teaching, a fund of $15,000,000 created in 1905 by Andrew Carnegie, the income of which is used for retiring allowances to officers and teachers in institutions of higher learning in English-speaking North America, and for pensions for the widows of such officers and teachers. In 1908, $5,000,000 was added to the original gift of $10,000,000, so that tax-supported colleges, universities, and technical schools, not included in the fund up to that time, might be admitted to its benefits. In 1911, Mr. Carnegie endowed the Educational Enquiry of the Foundation with $1,250,000. By 1918 798 allowances and pensions had been granted at a cost of $6,620,000. In this year the Foundation received from the Carnegie Corporation the sum of $13,000,000 to be used in the termination of its present system and the inauguration of a contributory system of pensions.

In order that the Foundation shall be an integral part of higher education in America, the trustees have dealt, so far as possible, with institutions rather than with individuals. For this reason, they created what is called the accepted list of institutions. To be placed on this, an institution must conform to definite regulations with regard to educational standards, form of government, and amount of endowment. Once an institution is placed on this list, its teachers and officers receive retiring allowances as a matter of right and under fixed rules as to age and length of service. Pensions to widows of teachers and officers are also granted under definite rules.

The fund is in the hands of a board of 25 trustees, who meet in November of each year. The administrative offices of the Foundation are in New York City. Consult *Bulletins* and *Reports* issued by the Foundation.

Carnegie Hero Funds. In 1904 a fund of $5,000,000 was created by Andrew Carnegie (q. v.), for the purpose of rewarding heroic efforts, to save human life in the United States, Newfoundland, and Canada, to relieve those injured in making such efforts, and to provide for those dependent upon them where life was sacrificed. The fund is managed by a commission of twenty-one members, who meet three times each year. Heroic acts are brought to the attention of this Commission either through direct application or through the public press. In each acceptable case a medal of gold, silver, or bronze is awarded; and in appropriate cases an additional award of money is granted. From the establishment of the fund in 1904 until January 22, 1919, 1461 medals (18 gold, 449 silver, and 994 bronze) and $1,709,898 were awarded. The offices in the Commission are in Pittsburgh, Pa.

The success of the American fund led Carnegie to establish a similar fund in Great Britain, in 1908, $1,250,000 for the purpose being placed in the hands of trustees in Carnegie's native place, Dunfermline, Scotland. A foundation for heroes was established in France (1909) by a gift of $1,000,000, and one in Germany (1910) by a gift of $1,500,000. Hero Funds have also been established in Denmark, Norway, Sweden, Holland, Italy, Switzerland, and Belgium.

Carnegie Institute, an institution for technical education given by Andrew Carnegie to the city of Pittsburgh in 1900. His original gift was $1,000,000, which was later increased until it reached a total of $4,000,000 for equipment and building, and $7,000,000 for endowment. There are four separate schools, each with its own faculty and student body, i.e., The School of Applied Science, School of Applied Design, School of Applied Industries, and Margaret Morrison School for Women. In 1918 there were 241 teachers and 3,149 students.

Carnegie Institution of Washington, an organization founded by Andrew Carnegie (q. v.) on Jan. 28, 1902, with a gift of $10,000,000, which he increased by $2,000,000 on Dec. 10, 1907, and by $10,000,000 on Jan. 19, 1911. The Institution was incorporated by act of Congress, approved April 28, 1904, the articles of incorporation declaring in general 'that the objects of the corporation shall be to encourage in the broadest and most liberal manner investigation, research, and discovery, and the application of knowledge to the improvement of mankind.' It is controlled by a board of 24 trustees.

The work may be conveniently classed under three heads: (1) Large projects or departments of work whose execution requires continuous research by a corps of investigators during a series of years. Ten such departments have been established, as follows: Botanical Research, Experimental Evolution, Economics and Sociology, Geophysical Laboratory, Marine Biology, Meridian Astrometry, Historical Research, Mt. Wilson Solar Observatory (q. v.), Nutrition Laboratory, and Terrestrial Magnetism. To these may be added the Eugenics Record Office recently taken over as the result of a gift from Mrs. E. H. Harriman. (2) Minor projects which may be carried out by individual experts in a limited period of time, or by investigators possessing exceptional abilities and opportunities for research work. Many grants in aid of this class of projects have been made. (3) The publication of the results of investigation made under the auspices of the Institution

The Administration Building of the Institution is located on the southeast corner of Sixteenth and P Streets, Washington, D. C. The President is Robert S. Woodward. To date (1919), about 400 volumes of publications, with an aggregate of more than 105,000 pages of printed matter, have been issued directly by the Institution.

During the Great War of Europe (q. v.) the services of associates and members of departmental and divisional staffs and the departmental organization of the Institution, with laboratory facilities and equipment, were freely offered to the U. S. Government, and valauble service was thereby rendered.

Carnelian, or CORNELIAN, in mineralogy, a variety of chalcedony (q. v.) of a bright red color, which takes on a fine polish and is used as a ring stone, and for brooches, seals, and ornaments. An oxide of iron is the coloring matter. It is the most precious of all forms of chalcedony, and is found, like agate and other secondary forms of silica, in nodular masses occupying cavities in rocks, from which it may be set free when the surrounding rock decomposes into earth. Fine specimens have been obtained in the United States (Florida), Nova Scotia, South America, India, Queensland, and elsewhere.

Carnic Alps, See SOUTH-EASTERN ALPS.

Carniola (German *Krain;* Russian *Ukrain*), former crown land of Austria; under the terms of the Austrian Peace Treaty (1919) included in the new Jugo-Slav state (see JUGO-SLAVS). It is bounded by Trieste on the west, Croatia and Slavonia on the south and southeast, and Carinthia and Styria on the north and northwest. Area 3,856 square miles.

It is traversed in the north by a continuation of the Carinthian Alps, and in the south by the Julian Alps, the loftiest summit being the Terglou (9,393 feet). The scenery of the country abounds in interesting and singular features, amongst which are Lake Zirknitz, the Adelsberg Grotto, and the rock-bridge of St. Kanzian. The climate is in general mild, except in the high mountainous parts. Agriculture is backward, but some districts yield excellent wines and much fine fruit. Flax, silk, maize, and honey are produced. The chief minerals are iron, quicksilver, and brown coal. Manufacturing is limited, but linen-weaving and coarse lace making are practiced. The people are mostly Slavonic. The capital is Laibach. Carniola was added to the Empire by Charlemagne, and until the close of the Great War was an integral part of the Austrian monarchy from 1335, except for the few years from 1809 to 1813. Pop. 525,000.

Carnival, a period of rejoicing and festivity, observed in many parts of Europe and America—usually between Epiphany and Shrove Tuesday. The forms and customs observed in the celebration originated without doubt in the pagan festivals of spring.

At the present day, the carnival is observed in Italy, and parts of Germany, France, and the United States, while it is found in very primitive form in remote regions of Thrace. In Rome the advent of carnival is announced on Twelfth Night by youths attired as monks and wearing masks, who perambulate the streets, shouting their news to the passersby; and during the succeeding days, masks, monks, *pierrots*, harlequins, columbines, and fantastic figures of every description are seen in the light of day as well as in ballrooms; while there are races of riderless horses, masked balls, and other sports and festivities. The carnival ends at midnight on Shrove Tuesday.

The carnival in New Orleans is the most famous of these revels in the United States.

Carnivora, an order of mammals. The large majority feed upon flesh of some kind, typically upon recently killed warm-blooded animals; but the bears, for example, are largely vegetable eaters. They are characterized by the fact that never less than four toes are present on each foot, by the nature of the teeth, and by certain internal peculiarities. The teeth afford an admirable illustration of the carnivorous or flesh-eating type of dentition: the incisors are small and pointed; the canines are strong, conical, and recurved, and are used to transfix the prey; while certain of the cheek teeth in both jaws in the more typical forms are compressed, sharp-edged, and constitute scissor-blades that are used to pare off the flesh from the bones (see CARNASSIAL).

The living carnivores are divided into two forms—the *fissiped*, in which the limbs are adapted for terrestrial progression; and the *pinniped*, which habitually live in water, and which have their limbs converted into flippers.

The classification of the fissiped carnivores is a matter of some difficulty, but the living forms are conveniently divided into (1) the cat section (Æluriodea), (2) the dog section (Cynoidea), and (3) the bear section (Arctoidea).

In the pinniped carnivores there is no sectorial or carnassial tooth, and the cheek teeth are very uniform. They include the eared or fur seals, the walrus, and the true seals—all aquatic animals, but differing from whales and their allies in coming on shore for breeding purposes.

Carnivorous Plants. See INSECTIVOROUS PLANTS.

Carnot, LAZARE NICOLAS MARGUERITE (1753 – 1823), French republican statesman, general, and mathematician, was born in Nolay in Burgundy. He was elected a member of the Legislative Assembly (1791), became a member of the National Convention (1792), and was appointed minister of war (1793). He reorganized the army, enforced a general conscription, and drew up plans of campaign. Although he opposed the establishment of the Directory, he was elected one of the directors in 1795, and again acted as minister of war, when he supported Bonaparte, and arranged with him the plan of the Italian campaign. Proscribed by Barras (1797), he escaped to Germany, and later joined the Tribunat, and opposed Bonaparte's assumption of imperial power. He was Minister of the Interior during the 'Hundred Days,' and a member of the provisional government of June 1815. Following the restoration of Louis XVIII., he retired to Germany, where he died. He published a number of valuable mathematical works.

Carnot, LAZARE HIPPOLYTE (1801–88), French public official, son of Lazare N. M. Carnot (q. v.), was born in St. Omer. He studied law, but because of his refusal to swear allegiance to the Bourbons was not allowed to practise. After spending some time in journalism, he was in 1839 elected to the Chamber of Deputies, where he remained, a strong radical, until 1848, when he became Minister of Public Instruction. He was again elected deputy for Paris in 1850, but refused to take the oath of allegiance to Napoleon III. and was not seated until 1864. In 1875 he was made a life member of the Senate. His publications include *Mémoires sur Carnot* (1861–4); *La révolution française* (1869–72); *Lazare Hoche* (1874).

Carnot, MARIE FRANÇOIS SADI (1837–94), president of the French republic, eldest son of Lazare Hippolyte Carnot (q. v.), was born in Limoges. He was educated as an engineer and had acquired a considerable reputation in his profession when in 1880 he was made Minister of Public Works. He occupied the same position again in 1885, and shortly afterward was made Minister of Finance. He was elected President of France in 1887 and was assassinated at Lyons shortly before the end of his term. The opening of the Paris Exhibition occurred during his presidency; the Panama scandals of 1892, while discrediting the state, in no wise reflected upon its head.

Carnot, NICHOLAS LÉONARD SADI (1796–1832), French physicist, son of Lazare Nicolas Marguerite Carnot (q. v.), was born in Paris. He was educated in the Polytechnic School and served on the corps of engineers in that institution, devoting his spare time to study and research. He is best known as the founder of the science of thermo-dynamics. His great work, *Réflexions sur la puissance motrice du feu*, published in 1824, describes his cycle and reversible engine. Professor Thurston's English translation (1890) includes an account of Carnot's theory by Lord Kelvin.

Carnuntum, cär-nun'tum, or CARNUTUM, ancient town of Pannonia, on the Danube, 16 miles southeast of modern Vienna. It was the headquarters of the Romans in their military operations against the Germans, and for three years the residence of Marcus Aurelius during his campaign against the Marcomanni. In the ninth century the town was destroyed by the Magyars. There are extensive ruins.

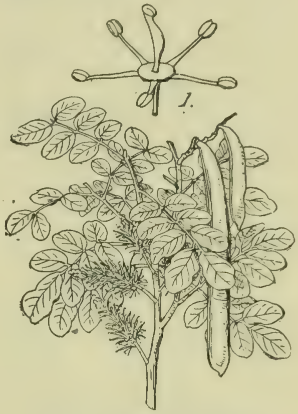
Carnutes, car-nū'tēz, a tribe of Gauls who lived in the centre of ancient Gaul, between the Liger (Loire) and the Sequana (Seine); their capital was Genabum (Orleans).

Car'o, village, Michigan, the county seat of Tuscola county, on the Cass River, and on the Detroit, Bay City and Western, and the Michigan Central Railroads; 30 miles east of Saginaw. Its manufactures include beet sugar, lumber, shoes, telephones, brick, flour, and marble works. It has, also, a canning factory. Pop. (1910) 2,272; (1920) 2,704.

Caro, kä'rō, ANNIBALE (1507–66), Italian poet, was born in Civitanova (March of Ancona). He became tutor in the family of Lodovico Gaddi in Florence and subsequently (1543) entered the service of the Farnesi at Parma and Rome. His most valuable work is his translation of the *Æneid* (1581); he also made a beautiful translation of Longus' *Amore Pastorali*, and his *Lettere familiare*, apart from the interest of their contents, are admirable by reason of their style. His bitter quarrel with Castelvetro because of the latter's criticism of his panegyric on the royal house of France has somewhat detracted from his good fame. Collected editions of Caro's works were published in Venice in 1757 (6 vols.) and in Milan in 1807–12 (8 vols.).

Caro, kȧ-rō', ELME MARIE (1826–87), French philosopher, was born in Poitiers. After being elected professor of philosophy at the Sorbonne (1864), he was, in 1871, enrolled a member of the French Academy. Such was his popularity at the Sorbonne that, as 'philosophe des dames,' he was satirized in the comedy *Le monde ou l'on s'ennuie*. His works include *Philosophie de Goethe* (1866); *Le matérialisme et la science* (1868).

Car'ob (*Ceratonia siliqua*), or LOCUST TREE, a handsome evergreen tree native to the Mediterranean region. It reaches a height of from 40 to 50 feet, and bears shining pinnate leaves, racemes of red flowers, and brown leathery pods containing a sweet gummy substance and small brown beans. In eastern countries the pods form an important forage crop and are even eaten by the poorer classes of the population in times of food scarcity. It is said that the seeds and pulp are the locusts and wild honey eaten by John the Baptist in the wilderness, and that the pods are the husks referred to in the parable of the prodigal son. Carob trees are grown in Florida and California. They are propagated by cuttings.



Carob (*Ceratonia siliqua*)
1. Single flower

Caroba. See JACARANDA.

Car'ol, originally a term for a dance, or for songs intermingled with dancing, later used to signify festive songs, particularly such as were sung at Christmas. The first printed collection of English carols came from the press of Wynkyn de Worde in 1521. A unique fragment of it is extant, containing the famous 'Boar's Head Carol,' which is still sung at Queen's College, Oxford, on Christmas day. The Puritans did their best to discourage carol-singing; but the practice was revived at the Restoration.

In France the singing of Christmas carols, called *noëls*, was common at an early date, and collections of *noëls* were published early in the sixteenth century. Russian literature is very rich in carols and religious songs generally. The best collection of them is by Bezsonov, under the title, *Kalieki Perekhozhie*, or 'The Wandering Cripples,' the singers being beggars and lame people who go about for charity. There is a large store of Manx carols, or *caroal*, but only a very few have been printed.

Consult Sandys' *Christmas Carols Ancient and Modern* and Bramley and Stainer's *Christmas Carols, Old and New*.

Caroli'na, AMELIA ELIZABETH (1768–1821), queen of George IV. of England, was the second daughter of Charles William Ferdinand, Duke of Brunswick. She was married in 1795 to the Prince of Wales, who forsook her immediately after the birth of their only child, the Princess

Charlotte (1796). Charges of grave impropriety having been brought against her, a commission of investigation was appointed in 1806, which cleared her of all guilt, though it could not acquit her of imprudence. After the death of George III., divorce proceedings were initiated against her; but so brilliant was the defence that the case was abandoned. At the king's coronation the queen was peremptorily refused admission to Westminster, a slight which she took much to heart. She died about three weeks later (Aug. 7, 1821). Consult Nightingale's *Memoirs of Queen Caroline.*

Carolina Allspice. See Calycanthus.

Carolina Tea. See Yapon.

Caroline Affair, a diplomatic difficulty between the United States and Great Britain arising in 1837. During the Canadian rebellion, certain insurrectionists seized Navy Island (British) in the Niagara River, to which men and supplies were subsequently conveyed in the American steamboat *Caroline.* A loyal Canadian party was sent to capture this vessel, and though they found her moored on the American shore, nevertheless seized and burned her, an American named Durfree being killed. The United States Government demanded reparation for this violation of neutrality, and the situation reached a crisis when in 1840 one Alexander McLeod, a deputy sheriff in Upper Canada, who had boastingly asserted that he was the slayer of Durfree, was arrested and tried for murder in New York. Great Britain immediately avowed responsibility for the death of Durfree, and demanded of the United States the release of McLeod. New York refused to surrender her jurisdiction to the National Government, but McLeod, defended, at Secretary of State Webster's instance, by the Federal district-attorney, was eventually acquitted, proving an *alibi,* and the threatened rupture between the two nations was averted. In 1842 Congress passed a law giving the Federal courts power to issue a writ of *habeas corpus* in the case of a prisoner committed by a State court for an act for which a foreign government assumed the responsibility.

Caroline Islands, an archipelago of about 600 islets and islands in the Pacific Ocean, between 1° and 10° N. lat. and 131° and 163° E. long. It is divided, for administrative purposes, into two groups, the Eastern and the Western, with a total area of about 380 square miles. Most of the islands are only small atolls, but there are about fifty of other formation and size, the most important being Ponape, Yap, Truk, and Kusaie. The climate, though rainy, is temperate and healthful, and the soil is fairly fertile. The products include copra, bêche de mer, vegetable ivory, nuts, pearl and turtle shell. Archæologically the islands are interesting on account of their cyclopean stone structures. Pop. about 45,000, mostly Malays, with some Chinese and Japanese.

The Caroline Islands were discovered by the Portuguese Diego da Rocha in 1527; they were given their present name in 1688, in honor of Charles II. of Spain. In 1899, by an agreement with Spain, they became a German possession. In 1914, soon after the Great War, they were occupied by the Japanese and are now administered by Japan under a mandate. A treaty between Japan and the United States, ratified March 1, 1922, assures the United States of free access to the island of Yap in all that relates to the operation of the Yap-Guam cable or any other cable which may be laid hereafter by the United States or its nationals. Consult Christian's *Caroline Islands.*

Caroline Matilda (1751–75), daughter of Frederick, Prince of Wales, was married in 1766 to Christian VII. of Denmark, to whom she bore the future Frederick VI. in 1768. Seduced by Struensee, she was involved in his fall (Jan. 17, 1772), was divorced from her husband after confessing her guilt, and banished to Celle, Hanover, where she died. Her sad story has been made the subject of several dramas. Consult Wraxall's *Life and Times of Caroline-Matilde.*

Carolings. See Carlovingians.

Car'olus, a gold coin first struck in the reign of Charles I., originally equal to £1, but later valued at 23 shillings. The name has been given to other coins of the period bearing 'Carolus' as the name of the monarch—*e.g.* a Carolus dollar.

Carolus-Duran, kar'ō-lus-dü-räṅ', Emile Auguste (1837–1917), French artist, originally known as Charles Emile Auguste Durand, was born in Lille. He studied in Lille and Paris, and having won the Wicar prize in the latter city, was able to travel and study in Italy. He first attracted attention by his dramatic painting *L'Assassiné,* exhibited in the Salon of 1860. Following this success he travelled in Spain, was greatly influenced in technique by Velasquez, and painted *St. Francis of Assisi* (1868). His other works include *The Glory of Marie de Medici* for the Luxembourg ceiling; *Lady with the Glove,* probably his masterpiece; *The Triumph of Bacchus,* and many portraits displaying great distinction of style. With Duran the pictorial element is secondary, the expression of vitality and an extraordinary talent in painting textures being his chief characteristics. Many American artists, among them John Sargent and Will Low, studied under him. He was a grand officer of the Legion of Honor, a member of the Academy of Beaux-Arts, and from 1904 to 1913 director of the French Academy in Rome.

Carot'id Artery, the great artery which divides into two branches, one on either side of the neck, and supplies blood to the head and neck. Each branch again divides into an internal and an external carotid, the former supplying the parts within the cranial and orbital cavities, and the latter, the exterior of the head, the face, and most of the neck. Wounds of the carotid are usually rapidly fatal. Compression of both causes fainting. See Circulation.

Car'otin, the coloring matter found in the carrot and in the tomato. It is present, also, in maize, squash, orange peel, mustard seed, and other vegetable matters and occurs as the coloring matter of milk-fat. It crystallizes in copper-colored leaflets, is insoluble in water but readily soluble in benzine and sparingly so in alcohol, ether, and chloroform.

Carp (*Cyprinus carpio*), a fresh-water fish, native of the East, especially China, but abundant as an introduced form throughout Europe and North America. The body is compressed and covered with large scales, the mouth rather small and furnished with four barbels; the dorsal fins are much longer than the anal. The carp is generally dark brown in color, from 12 to 17 inches long, and weighs about 20 pounds, though it sometimes attains a much greater weight. Its diet is varied, consisting of vegetable matter, worms, insects, and small crustacea. It is exceedingly hardy and long-lived, some specimens being said to attain an age of 200 years. As a food fish, the carp is esteemed in Europe, particularly in Germany; in America it has not found much favor. Allied is the crucian carp (*Carassius vulgaris*), widely dis-

Carp

tributed throughout Europe, and the gold-fish (*C. auratus*), all belonging to the family Cyprinidæ.

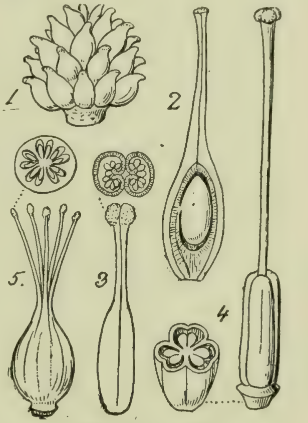
Carp, PETRACHE (1837), Roumanian statesman, born at Jassy (Iasi). After entering politics as a Conservative, he separated from that party on the education question, and founded the Junimist or Young Roumanian party (1876). Carp held office in 1890 and 1892–5, and became premier in 1900 in order to reduce the financial deficit by taxation reform, but was defeated. For the east of Europe, Carp is an example of political integrity. He is the author of several useful economic laws—*e.g.* mining laws.

Carpaccio, VITTORE (*c.* 1450–*c.* 1522), Venetian painter, of whose life little is known. He was employed in the school of St. Girolamo with Vivarini and Giovanni Bellini, and it is surmised that he may have accompanied Gentile Bellini to Constantinople. His fine qualities as a religious painter are shown in his masterpiece, *The Presentation in the Temple* (1510, Venetian Academy)—intricate composition, graceful figures, and rich but restrained color. His St. Ursula series of paintings (Venetian Academy), and the nine canvases in San Giorgio degli Schiavoni illustrating the lives of Saints Tryphon, Jerome, and George, show great dramatic qualities. His finest works are in Venice, but good examples are in Ferrara, Vienna, Berlin, Stuttgart; and an early *Virgin and Child* is in the National Gallery, London. For the modern appreciation of Carpaccio we are indebted to Ruskin.

Carpathians, one of the principal mountain ranges of Europe, sweeping in an irregular semicircle round the N.W., N., N.E., E., and S.E. of Hungary, which it barricades against Moravia, Galicia, and Roumania. Length from the Danube, in the W., to the Iron Gates, in the E., nearly 1,000 m., with a breadth varying from 10 to 200 m. The system consists of the following series of ranges, following one after another: Little Carpathians (2,400 to 3,200 ft.), White Mts., W. Beskids (Phlsko, 5,110 ft.; and Babia Gora, 5,660 ft.), E. Beskids, Carpathian Forest Mts. (Guimaleu, 6,100 ft.; Czerna Gora, 6,750 ft.), Transylvanian Highlands, and Alps; together with a number of semi-independent subsidiary mountain groups or spurs jutting out into the Hungarian plain. Between the E. and W. Beskids are the 'dropped links,' much farther to the S., of the (Hohe) Tatra (5,000 to 6,000 ft. above the plain; absolute elevation, 8,000 to 8,700 ft.) and the Niedrige (Nizna) Tatra, which contain the most imposing scenery of the W. Carpathians, and are much visited by tourists. On the N. and N.E., but still more on the S. of Transylvania, are the most imposing altitudes of the system—Pietrosza (7,440 ft.), Pietroszul (6,900 ft.), Königstein (7,355 ft.), Bucsecs (8,265 ft.), Vunetara (8,255 ft.), Negoi (8,320 ft.), the culminating point. The Carpathians contain the rich petroleum stores of Galicia, salt, gold, silver, copper, coal, and other minerals, together with mineral springs. Although many of the peaks of the Carpathians rise above the snow-line and the normal limit of forest growth, yet, owing to their steepness and to the scanty precipitation (24 to 35 in. annually), there are no real glaciers in the system. Although the middle parts of the system are, generally speaking, inaccessible, there are several convenient passes, such as the Jablunka (1,810 ft.), over which runs the Cracow-Pressburg Ry.; the Jordanow (2,630 ft.), Tarnow-Kaschau Ry.; and the Dukla (1,650 ft.). Farther E. the Lemberg Munkacz line crosses by the Rodna Pass (4,128 ft.) and the Borgo Pass (3,940 ft.), both leading into Bukowina. Transylvania is connected with Moldavia by the Tolgyes (2,135 ft.), Gyimes (2,955 ft.), Oitoz (1,410 ft.), and other passes; and with Walachia by Tömös or Predeal (3,375 ft.), the famous gorge of the Rother Thurm (1,155 ft.), the Vulcan (3,095 ft.), and the defile of the Iron Gates close beside the Danube.

Carpeaux, JEAN BAPTISTE (1827–75), born at Valenciennes, was one of the most characteristic French sculptors of the second half of the 19th century. His ideal was the expression of life in all its attitudes. Among his works are *La Palombella* (1858), a bust of an Italian girl; the bronze group of *Ugolino and his Children* (1863), in the Tuileries Gardens at Paris; the bust of the *Princesse Mathilde* (1863); the bust of *Alexandre Dumas fils* (1874); the group of the *Four Parts of the World*, adorning a fountain in the Luxembourg Gardens at Paris. He executed also the bas-reliefs for the Flora pavilion of the Louvre, the principal subject being *France Shedding Light through the World and Protecting Science* (1866). But one work, *The Dance* (1869), adorning the façade of the New Opera House at Paris, created a great controversy by reason of the novelty of its naturalistic tendencies, and even led to an attempt to ruin its effect. See Chesneau's *Le Statuaire J. B. Carpeaux* (1880); W. C. Brownell's *French Art* (1902).

Carpel. The central part of a flower is the pistil or gynæcium, and its several parts of floral leaves the carpels. Each carpel consists of a swollen hollow part called the ovary, enveloping the ovule or ovules, which when fertilized become seeds; of an expanded superior surface called the stigma, to which adhere the pollen grains destined to fertilize the ovules below; and generally, also, of a stalk or column between the ovary and the stigma. When the carpels are joined so as to form a united pistil, or when the ovaries are joined, and the styles and stigmas are not united, the pistil is spoken of as syncarpous; otherwise, it is said to be apocarpous.



Types of Carpel.

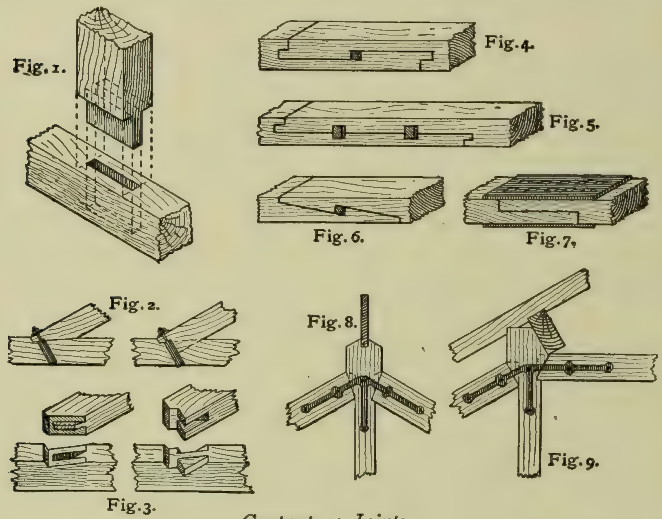
1. Apocarpous (buttercup); 2. monocarpellary (peach); 3, bicarpellary and section (erythrea); 4, tricarpellary and section (lily); 5, polycarpellary and section (linum).

Carpentaria, GULF OF, N. of Australia, about 300 m. from W. to E., between Capes Arnhem and York, and 400 m. from N. to S. Into it flow the rivers Mitchell and Van Diemen on the E.; Flinders, Leichhardt, and Albert on the S.; and Roper on the W. It is deeply indented, and contains several islands (Groote Eylandt, Wellesley). Its E. coast was discovered by the Dutch in 1606.

Carpenter, LOUIS GEORGE (1861), American irrigation engineer and teacher, born at Orion, Mich. He graduated at the Michigan Agricultural College in 1879 and studied at the University of Michigan and at Johns Hopkins University. He taught mathematics at his alma mater in 1881–88, was professor of engineering and physics at the Colorado Agricultural College, became well-known as an irrigation engineer, and was state engineer of Colorado (1903–4).

Carpenter, MARY (1807–77), English philanthropist, was born at Exeter. Dr. Tuckerman, the Boston philanthropist, stimulated her to work for destitute children. The passing of the Youthful Offenders Bill (1854) was largely due to her exertions. She visited the U.S. in 1873, and lectured there and in Canada on prison reform. Author of *Reformatory Schools* (1851), *Juvenile Delinquents* (1853), *Memoir of Joseph Tuckerman* (1848), reprinted in *American Unitarian Biography*, vol. ii. (1851), *Our Convicts* (1864), *Last Days in England of the Rajah Rammohun Roy* (1866), *Six Months in India* (1868), and *Reformatory Prison Discipline* (1872). See *Life* by J. E. Carpenter (1879).

Carpenter, MATTHEW HALE (1824–81), American senator, was born at Moretown, Vt., and entered, but did not stay to graduate from, West Point. He was admitted to the bar of Vermont in 1847, and the following year established himself at Beloit, Wis., soon building up a brilliant reputation as a lawyer and removing to Milwaukee. He supported the Union as a war Democrat during the Civil War, and afterward, in 1868, with Lyman Trumbull successfully maintained the validity of the reconstruction act of 1867 before the U. S. Supreme Court. For this and other services Grant and Stanton recommended his election to the U. S. Senate, and he was elected by the Republicans of Wisconsin, holding office from 1869 to 1875. Returning to his practice he defended Secretary Belknap from charges made by the U. S. House of Representatives, and was counsel for Samuel J. Tilden before the electoral commission of 1877. He was again elected to the U. S. Senate in 1879, holding office until his death. Senator Carpenter was an opponent of slavery at the outbreak of the war and was in favor of the franchise for the freedmen. He made many brilliant speeches in the Senate. See Flower's *Life* (1883).



Carpentry: Joints.

Carpenter, ROLLO CLINTON (1852), American engineer and educator, born at Orion, Mich. He was educated at the Mich. Agricultural College, at the University of Michigan, where he graduated C. E. in 1875, and at Cornell University; and was a professor in the Michigan Agriculture College from 1878 to 1890, when he became professor of experimental engineering in Cornell University. He also gained a wide reputation as a consulting engineer. His publications include *Experimental Engineering* (1890; 6th ed., 1902), and *Heating and Ventilating Engineering* (1898; 5th ed. 1902).

Carpenter, WILLIAM BENJAMIN (1813–85), English naturalist and physiologist, brother of Mary Carpenter; born at Exeter; studied medicine in London and in Edinburgh. He is the author of *Principles of General and Comparative Physiology* (4th ed. 1854), *Principles of Mental Physiology* (7th ed. 1896), and *The Microscope and its Revelations* (8th ed., by Dallinger, 1901). Carpenter was lecturer on medical jurisprudence at Bristol, and Fullerian professor of physiology at the Royal Institution, London. He obtained the Royal Society medal (1861), and was president of the British Association for the Advancement of Science (1872).

Carpenter Bee, a bee so named on account of its habit of forming a nest in dry wood, in which it excavates parallel galleries. Within these galleries cells are formed of wood pulp moistened by salivary juice. (See BEES). Numerous species occur in the United States, of which *Xylocopa virginica* is the largest and best known species of the Northern states. It is numerous and widely distributed; and as it very often cuts its tunnels into the timbers of porches and outhouses its interesting habits may be easily observed. Consult Packard *Text-book of Entomology* (1898).

Carpentras, tn., dep. Vaucluse, on the riv. Auzon, 17 m. N.E of Avignon by rail. It is a walled town with four gates, the Porte d'Orange being one. The cathedral is Gothic, and there is also a Roman triumphal arch. From the 5th century to 1805 Carpentras was an episcopal see. There are felt-hat and silk factories, tanneries, dye-works, and flour mills. Pop. (1901) 10,443.

Carpentry is the art of working timber with cutting and other tools. A knowledge of the laws of mechanics is required in order to design successfully roofs, floors, bridges, the centering for arches, and those other structures in which a correct proportion and disposition of the component parts is essential.

Joints.—The first requisite is a knowledge of the different methods of joining pieces of timber so as to bear the strains which come upon them under varying conditions. The mortise-and-tenon joint (Fig. 1) is used in all varieties of framing, where one piece of timber meets another without crossing it. The tenon, or projecting portion left on the end of the first timber, fits tightly into the mortise, or hole, cut in the second, and is secured to it by glue or by wedges driven into it on the farther side. Modifications of this are shown in Figs. 2 and 3, and are adapted for cases where the entering timber is at an acute angle with the receiving piece, and presses against it in the direction of its length. The joints of rafters and tie-beams, also those of bridge struts and piers or longitudinals, afford example of these and similar joints, in which great care is necessary to provide a bearing surface at right angles to the direction of the thrust. In rougher work, instead of the mortise-and-tenon joint, the plan is often adopted of 'halving' the portions of timber in contact, so that when joined they present a flush face, afterward uniting them firmly by one or more bolts. Notching, cogging, and housing are somewhat similar operations, performed to join timbers which cross each other—no strength of union; however, being obtained without the use of bolts and straps. Dovetailing, which plays so large a part in joinery, is of but little use in carpentry, owing to the fact that the shrinkage inseparable from timber of any size renders the joint useless for purposes of strength. Scarf joints (Figs. 4, 5, 6, 7) are employed in joining longitudinal timbers so as to form a beam of greater length than a single piece of wood would naturally afford. The methods of scarfing shown in Figs. 4 and 5 are especially adapted for cases where the timber is in tension or compression. Figs. 6 and 7 exemplify patterns more useful for resisting a bending strain, when strengthened with bolts—which are also largely employed for securing the other forms of joint. Hard-wood keys are previously driven through the holes in the joint, to make the parts of it fit closely to each other; and while these must be driven in sufficiently tight to close up the joint, care must be taken to avoid any strain being put on the fibres of the wood by forcing the parts together too much. All kinds of joints may be strengthened by iron straps, forged to the exact shape required, and bolted to the wood. Figs. 8 and 9 show the rafters of a roof firmly connected to the king and queen posts respectively by straps laid on the sides of the different members.

Roofs.—The simplest form of roof, employed only for spans under 20 ft., consists of common rafters meeting at a ridge-pole, and held together by a light tie or 'collar-beam' at about the centre of each. The lower ends of the rafters rest on a wooden wall-plate, which they are notched to receive. For larger spans trussed 'principals' are adopted. The simplest form of these is the king-post roof, in which a tie-beam holds together the feet of the principal rafters. The weight of the tie-beam is held by a vertical king-post attached to the rafters at their apex, and supporting on 'shoulders' near its base two diagonal struts which stiffen the rafters. For spans over 30 ft. the king-post is usually replaced by two queen-posts, in order to avoid leaving the rafters unsupported for so much as half their length. Figs. 10 and 11 show these two types of roof principals, of which all others up to the largest spans are modifications or combinations, with the exception of those special designs for churches and public buildings in which a tie-beam is omitted for the sake of architectural effect. In these cases stability is assured by the walls being sufficiently strong to withstand the resultant horizontal pressure or by the roof principals being of a form approximating to that of an arch.

The roof principals are usually placed at a distance of about ten feet apart. They are connected by longitudinal timbers called 'purlins,' which in their turn support the 'common' rafters on which the roof itself is laid. In roofs of large span, where the principals are necessarily heavy and costly, an economy may be effected by spacing them farther apart and strengthening the purlins (which have to bear a cross strain) by means of trussing—a method not infrequently applied also to long beams in bridges and other temporary works. Trussing consists in supporting the beam by two or more iron struts near the centre, their weight being carried by iron tension rods which have a bearing on the fixed ends of the beam. The chief objection to this is the high crushing stress which is brought on the wood where the tension rods are fixed. For temporary work, and for such particular uses as that of lengthy purlins in a large-span roof, the truss is advantageous; otherwise, it is preferable to use an iron girder for a long beam under a bending load.

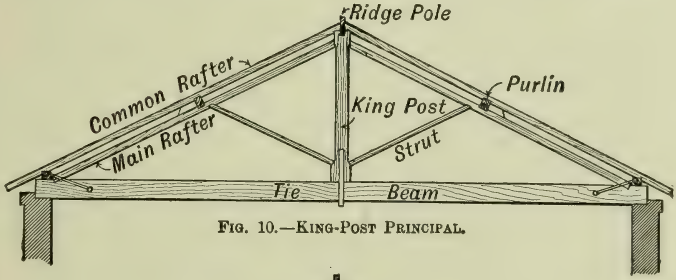


Fig. 10.—King-Post Principal.

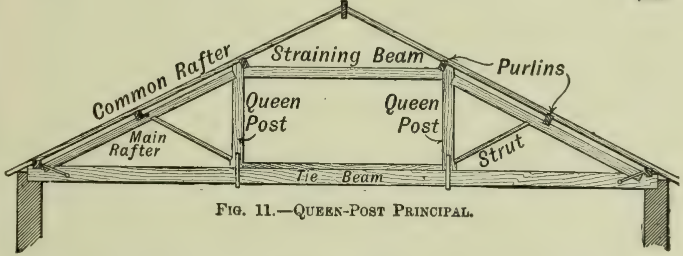


Fig. 11.—Queen-Post Principal.

Carpentry: Roofs.

Floors.—The timber framing which supports the flooring boards of the room above and the ceiling of the room beneath is constructed on one of three general designs. (1.) Single-joisted floors consist of only one series of joists, which rest on the wall-plate at either end. If an obstacle, such as a fireplace, intervenes, a bearing is afforded on a cross-piece, or 'trimmer,' which is mortised into the full-length joist on each side. (2.) Double floors have three tiers of joists—(*a*) the binding joists, which are the chief supports, and which rest on the walls (as before); (*b*) the bridging joists above and (*c*) the ceiling joists below, which cross the main series and are notched into them, holding respectively the floor boards and the ceiling. (3.) Framed floors have in addition main beams, into which the binding joists are framed at intervals, instead of crossing the whole width of the room. Each variety of floor has its own use—framed floors being adapted for large spans, double floors where an even ceiling is essential, single floors for moderate-sized rooms, where strength and lightness are first considerations. The joists of single floors should, for all spans above 8 ft., be strutted together at intervals, to prevent them turning or twisting. A system of diagonal or 'herring-bone' strutting is the most efficient.

Partitions are frames of timber used for dividing the upper stories of a house into rooms. They are usually faced on each side with lath and plaster; or the spaces between the timber may be filled in with concrete or brickwork.

Centres are curved frames for supporting the arch stones of bridges or vaults during the construction of the arch. The vertical frames or 'ribs' of which centres are composed are placed from 4 to 6 ft. apart, and are connected by horizontal ties and by diagonal bracing. On them is laid the 'lagging' of narrow boards which carries the stones of the arch. The ribs are built up of a series of short timbers shaped on the outside to the curve of the arch, and supported at their junctions by radial struts. For a small span these struts converge to one or more points on the tie-beam, which is, if possible, there supported by vertical posts from the ground. In the centres for a large bridge a system of trussing must be adopted by which for each rib the load of the arch is transmitted to two points at the extremities of the chord. These points rest on some fixed support, with the intervention of two or more wedges, which are driven in when the centre is first adjusted. When the arch is finally keyed in, and it is desired to strike the centres, the wedges are gradually knocked back and out, so as to let the rib down by degrees and allow the arch to take its proper bearing slowly.

Staging and Gantries.—The design of permanent bridges of large span, in which wooden trusses may be made to take the place of the voussoirs of a masonry arch, or the members of an iron lattice girder, comes more under the province of the engineer.

Staging consists of two rows of standards (squared timbers of large scantling) stiffened and braced by diagonals, and connected at the tops by longitudinal beams which serve to carry a platform or a line of rails. The bases of the standards are usually set on a sill of horizontal timber resting on the ground. Short cross pieces are fixed to their heads, so as to give a better bearing for the longitudinal 'runners,' which are also supported by diagonal struts, butting on cleats fixed to the sides of the standards. The different members of such a structure are joined together by bolts. A gantry is a staging of considerable length used to carry a travelling crane. See Holly's *Carpenters' and Joiners' Handbook* (1863).

Carpet-Baggers, a name derisively applied to those Northern men who went South after the Civil War and took an active part in Reconstruction politics, as leaders of the negroes and often as office-holders in the Reconstruction governments of the various Southern states. The name arose through the assertion that these men, mere political adventurers as Southerners believed, and actuated chiefly by the desire for gain, which they would not hesitate to secure through corrupt means, went to the South with only so much property as might be carried in a carpet-bag.

Carpet Bug, a small spotted beetle of the destructive family Dermestidæ, which, when adult, feeds upon the pollen of flowers. It has, since about 1870, learned to enter houses and lay its eggs in the dust of floor-corners, where the larvæ, as soon as they hatch, begin to feed on the wool of the carpet, and later form from the shreds cocoons in which to pass the pupa stage. Where carpets are nailed down, and not frequently shaken, they may thus do great damage. The better practice of using loose rugs, assiduous cleanliness and the use of pyrethrum powder will prevent or remedy this harmfulness. This beetle is *Anthrenus scrophulariæ*, and is an accidental importation from the Old World.

Carpet Moths, a name given by British collectors to many of the Geometridæ, whose larvæ are called 'loopers,' and which have beautifully-patterned wings. In the United States the same name is carelessly given to the larva of the carpet beetle, on the ignorant supposition that it is a kind of clothes moth.

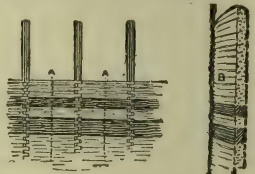
Carpet Snake, a large, harmless, highly variegated and extremely common Australian serpent (*Morelia variegata*).

Carpets came to us originally from the East, where the rug or carpet is the most important—often, indeed, almost the only—furnishing of the house: the Moslem always spreads his carpet for prayer. Turkey, Persia, and India still send us the most beautiful examples of the art, though the perfect designs of old time are being vulgarized by the disastrous influence of the West. But it is with the modern industry, as carried on in large factories, that we have here to do. France was the first to develop carpet-making (at the Louvre in 1607); but the revocation in 1685 of the Edict of Nantes drove many French craftsmen across the Channel, to settle at Bristol, Axminster, and other places in the S.W. of England. At this date the carpet had not replaced the floor covering of strewn rushes in Britain. The industry soon spread to Glasgow, Kidderminster, and the Yorkshire towns. It was started at Philadelphia, in 1791, and was greatly developed there and in other American cities; and since then the U. S. has played the most important part in the designing of carpet looms, though no new structure of carpet has been invented.

There are two distinct classes of carpets—*viz.* ordinary woven fabrics and pile fabrics.

Ordinary Woven Fabrics.—These are variously known as Ingrain or Kidderminster carpets. The earliest known example of this double-cloth structure dates from about the 16th century. The industry was introduced to Kidderminster from Bristol in 1735, though the first power-loom for the purpose was invented in Scotland in 1830. These carpets have a flat surface, and are reversible; but the relation of colors on one side is opposite to that on the other, so that if there is a black design on a red ground on one side, there is a red design on a black ground on the other.

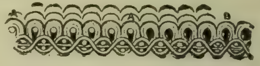
Of *Pile Fabrics* there are three principal kinds—*viz.* (1) Chenille Piles, known as Chenille Axminsters; (2) ordinary wired Piles, known as Tapestry, Brussels, Wilton, or Velvet carpets, and (3) Tuft-woven Piles, known as Victoria, Royal, etc., Axminsters.



Preparation for Chenille Carpet.

Cut into strips at dotted lines A to form B.

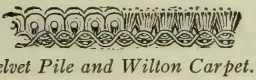
Chenille Axminsters.—Chenille (Fr. 'caterpillar') denotes a thick, loose, fluffy thread. The figure on this carpet is of a colored pile formed by a series of woven pile-thread, or, as they are technically called, 'chenille-picks.' Each pick is of one of the colors of the design, and the weaving operation consists in laying these picks in their right relative positions in the cloth. The picks themselves are first woven in the required colors on a kind of gauze foundation, which holds the fluffy pile very firmly.



Section of Brussels Carpet.

Loops woven over wires A; B, wires removed.

The *Brussels* is a wired-pile carpet. Its pile consists of loose loops of worsted thread formed over wires, and held down at their bases by a firm fabric of linen threads, into which the colored worsted loops are woven. The Flemish origin of this carpet is shown by the width of the piece being still the Flemish ell; and the first Brussels carpet loom introduced into England came from Touray in 1749. When the wires, after forming the loops, cut through them at their highest point, the *Wilton* or *Velvet* carpet is produced; the pile in this case forms a kind of plush. The *Tapestry* carpet is the simplest form of the wired-pile carpet, and resembles a Brussels carpet. The pattern is, however, not produced by the weaving together of threads of different colors, but is printed on the warp in an elongated form. The looping of the warp by the wires in the weaving process reduces the pattern to its proper proportions. The tapestry carpet usually has a wadded ground texture, to give the necessary elasticity. The warp is printed, thread by thread —a method which allows of a large number of colors.



Velvet Pile and Wilton Carpet.

A, Loops on wires; B, loops cut to form pile.

Carpets of the tuft-woven pile or moquette type were first made at Nîmes, France, on hand looms. The power loom which produces the tufted pile was invented in the United States in 1856. The essential feature of these carpets is the introduction into a simple framework of warp and weft of a series of tufts sufficiently long to form a pile. Woollen yarns corresponding in color to the colors in the design are wound side by side on spools—one for each row of tufts. These are then fixed in the loom in an endless chain, and the yarns are fed through a series of small tubes attached to the spools into the body of the carpet, and are cut by machinery.

Special varieties of carpets are woven from strips of brightly colored rags, common in the United States from colonial times, and from grass and vegetable fibres.

Statistics.—In the United States, according to the U. S. Census of Manufactures for 1914, there were 97 establishments devoted to the manufacture of carpets and rugs, exclusive of jute carpet, with a capital of $85,153,828 and products valued at $69,128,185. The amount and value of the principal varieties of carpets and rugs were as follows: Axminster and moquette, 15,742,835 square yards, $18,578,693; Wilton, 5,616,263 square yards, $11,929,605; body Brussels, 2,698,840 square yards, $3,995,626; tapestry velvet, 13,227,819 square yards, $12,867,635; tapestry Brussels, 13,614,354 square yards, $9,852,647; ingrain, 8,973,270 square yards, $3,406,381. The industry is confined to six States—New York, Pennsylvania, Massachusetts, Connecticut, New Jersey, and Indiana.

See RUGS. Consult F. Bradbury's *Carpet Manufacture;* W. S. Murphy's *The Textile Industries* (vols. vi., vii., 1912).

Carpet Sweeper, a dust-saving device for sweeping carpets and rugs, the principle of which is that of a brush revolving inside a dustpan, thus picking up the dust and confining it at the same time. The vacuum cleaner, by which dust is extracted by means of air suction, is now largely replacing the sweeper, especially in hotels and large establishments. See VACUUM CLEANERS.

Carpi, kär′pē, town and episcopal see, province Modena, Italy; 9 miles north of Modena. It has two cathedrals and a fine Renaissance church of the fifteenth century, and carries on silk industries. Pop. (commune) 23,000.

Carpi, village, Italy, 28 miles southeast of Verona, celebrated for the victory obtained here by Prince Eugene over the French in 1701.

Carpoc′rates, an Alexandrian Gnostic of the second century, who taught the pre-existence of souls, and founded the Gnostic sect of Carpocratians. According to him, those who can recall their pre-existing state may regain the harmony of complete union with God. The essence of true religion consists in the union of the soul with the Monas or highest God, by means of contemplation, which liberates it from the necessity of submitting to the common laws of society. Among those who have attained to this are Jesus, Pythagoras, Plato, and Aristotle. See GNOSTICS.

Car′polites, or CARPOLITH, the fossil fruits of certain carboniferous trees. Some of these are heart-shaped bodies; some are ellipsoidal and usually three-angled; others are ellipsoidal with a wrinkled and finely granulated surface.

Car′pophore, in botany, is a continuation of the flower stalk, which passes in certain flowers, notably those of the order Umbelliferæ, between the carpels, until it reaches their highest points. Often when the carpels are ripe, and separate from one another, they remain attached to the carpophore at its summit.

Car′pospore, one of the spores in the life history of the red algæ (Rhodophyceæ).

Carpus, Carpal Bones. See HAND; SKELETON.

Carquinez, kär-kē′nās, or KARQUINES, a strait, 7 miles in length, connecting Suisun and San Pablo Bays in California, and dividing Contra Costa and Solano counties. Benicia, Martinez, and Port Costa are situated on its shores.

Carr, EUGENE ASA (1830–1910), American soldier, was born in Concord, N. Y., and was graduated from West Point (1850). He joined the cavalry, served on the frontier, and was wounded in Texas (1854). He fought throughout the Civil War in the Union Army, taking part in the Battles of Wilson Creek, Pea Ridge, and Champion Hills, and in the capture of Vicksburg and Mobile. He was brevetted major-general for his services, and received a medal of honor from Congress. After the war, as lieutenant-colonel and colonel, he served with distinction against the Sioux, Cheyenne, and Apache Indians in the West, being in command against the Apaches in Arizona and New Mexico (1880–1). In 1892 he became a brigadier-general, and in 1893 retired.

Carr, JOSEPH BRADFORD (1828–95), American soldier, was born in Albany, N. Y. At the outbreak of the Civil War he was commissioned as colonel of volunteers in the Union Army; became brigadier-general (1862), taking part in the Peninsular Campaign and in the Battles of Bristoe Station, Fredericksburg, Chancellorsville, and Gettysburg; and retired with the brevet of major-general of volunteers (1865). Subsequently he served as secretary of state of New York (1879–85).

Carr, ROBERT. See SOMERSET, EARL OF.

Carracci, kär-rät′chē, or CARACCI, a celebrated family of Italian painters, the founders of the Bolognese or Eclectic school of painting. The best Italian masters of the seventeenth century—Domenichino, Guido Reni, Albani, and others—proceeded from the school of the Carracci.

LUDOVICO CARRACCI (1555–1619) was born at Bologna. He studied under Tintoretto; went to Venice and Parma, making acquaintance with the works of the great masters there; and returned to Bologna imbued with art principles quite opposed to the superficial mannerism then prevailing in his native city. In conjunction with two of his cousins, Agostino and Annibale, he founded (1589), in spite of great opposition, the Eclectic school which afterward became so famous in the history of painting. The first principle of this new school was that 'observation of nature ought to be combined with imitation of the best masters.' So great was their success that in the course of a short time all other schools of painting were closed in Bologna. Some of the finest works of this master are preserved at Bologna—among others, the *Madonna and Child Throned, Madonna and Child Standing, The Transfiguration,* and the *Nativity of St. John the Baptist.*

AGOSTINO CARRACCI (1558–1602), cousin of Ludovico, was born at Bologna. He became a disciple of his cousin, but he also achieved a name for himself as an engraver. He accompanied his younger brother Annibale to Rome, and there assisted in some of the paintings in the Farnese Gallery. He afterward settled in Parma, and is remembered for his

Communion of St. Jerome, and *Love: Celestial, Terrestrial, and Venal.*

Annibale Carracci (1560–1609), brother of Agostino, was born at Bologna. He was one of the greatest followers of Correggio, and in composition approached most nearly to the style of Raphael. Ludovico had a greater talent in teaching, and Agostino had a more versatile invention, but Annibale was unquestionably the greatest artist of the three Carracci. His best work are his mythological frescoes in Rome, which have been frequently engraved.

The work of the Carracci is characterized by correct technique, large design, and fine figure drawing, but it lacks spontaneity and creative impulse. Their great merit is to have arrested the decline of Italian art for a period, to have encouraged the production of easel pictures, and to have liberated Italian landscape art from its dependence on figure subjects.

Carrageen, kar′*a*-gēn, Carrageen Moss, or Irish Moss, the Irish name of *Chondrus crispus*, and some other allied species of seaweeds, long of local importance as an article of food, but now widely diffused. The true carrageen occurs commonly on rocky shores, particularly in Northern Europe, presenting many local varieties. It is sometimes as much as twelve inches long, branched by repeated forking, tough and flexible, and of variable color, from yellowish green through shades of red to purple. After being collected and washed in fresh water, it is bleached and dried in the open air; and is then white or yellowish, dry, shrunken, horny, and translucent.

When treated for ten minutes with cold water, in the proportion of half an ounce of carrageen to three pints of water, and then boiled and strained, it yields, with or without spices, a pleasant drink. With a larger proportion of carrageen, a thickish liquid or *mucilage* is obtained; and on boiling down this strong decoction, and cooling, a stiff *jelly* is procured. Milk may be employed instead of water.

Carran′za, Venustiano (1859), Mexican general, constitutionalist leader, and president, was born in Cuatro Cienegas, in the state of Coahuila. He studied law in Mexico City, and returned to Coahuila to conduct his farm, devoting his leisure to the study of history and political economy. In 1893 he led a successful rebellion against Garza Galan, governor of Coahuila, and in 1910 joined the revolutionary forces of Madero. On the establishment of peace he returned to Coahuila, and was elected governor. In February, 1913, after the arrest of President Madero (q. v.) and Suarez by Huerta (q. v.), Carranza obtained from the legislature extraordinary powers to sustain the constitutionalist orders of the Republic by force of arms, and in March published the Plan of Guadalupe, in which he is named First Chief of the Constitutionalist Army. He travelled through Northern Mexico, organizing the local and federal governments, and in September reached Hermosillo (Sonora), where as provisional president he established his capital. He eventually entered Mexico City on Aug. 20, 1914, but subsequently moved his government to Vera Cruz. On Oct. 9, 1915, the Pan-American Conference, representing seven American republics, including the United States, recognized him as president of Mexico. On Sept. 30, 1916, he issued a decree abolishing the office of vice-president, and reducing the presidential term from six to four years. See Mexico, *History.*

Carrara, kär-rä′rä, town, province Massa Carrara, Italy; 18 miles by rail southeast of Spezia. It lies in a valley of the Apaun Alps, and is famous for its quarries of fine-grained marble, mostly white, but also black, yellow, and green. There are hundreds of quarries in the neighborhood, giving employment to over 10,000 men, and over $1,000,000 worth of marble is exported annually from the port of Avenza, 3 miles distant, on the Mediterranean. There are an academy of fine art, a school of sculpture, and many artists' ateliers in the town. The Carraran marble was known to the Romans, who called it *marmor lunense* (from the port of Luna). Between the downfall of the empire and the end of the fifteenth century it was not worked; it is now, however, in great request. The marble is a white saccharoid limestone, which derives its value to the sculptor from its texture and purity. The quarries are on the side of the mountains, a branch of the Apennines, at heights varying from 500 to 3,500 feet. Pop., including Avenza, 42,000.

Carrel, kȧ-rel′, Alexis (1873), French-American surgeon and biologist, was born in Lyons, France. He was graduated from the University of Lyons in 1890 (B.S. 1891), became an interne in the Lyons Hospital, and received the degree of M.D. in 1900. In 1905 he came to the United States, where he first attracted attention by his articles (with Dr. C. G. Guthrie) on *Anastomosis and Transplantation of Blood Vessels* and *Amputation of the Thigh and Its Replantation.* He has been associate member (1909–12) and member (since 1912) of the Rockefeller Institute for Medical Research, and in 1912 was awarded the Nobel Prize for Medicine. He has made highly valuable discoveries in the surgery of the blood vessels, and has carried out researches of far-reaching importance on the transplantation of tissues and organs, the cultivation of living tissues apart from the body, and the preservation of life in cold storage. During the European War he assumed charge of the Military Hospital at Compiègne, where he introduced an efficient treatment for septic wounds. He has published numerous monographs of his surgical operations.

Carrel, Nicolas Armand (1800–36), French publicist, born at Rouen. After a short military career he became Thierry's secretary and collaborator. In 1830 he joined Thiers and Mignet in editing the *National.* When, after the Revolution of 1830, his colleagues entered the government, and Carrel was left editor-in-chief, his bold and spirited attacks on the monarchy enhanced the *National's* popularity, which government prosecutions and fines only stimulated. A newspaper war with the editor of *La Presse* led to a duel, in which Carrel was mortally wounded. His *Œuvres Politiques et Littéraires* were edited by Littré.

Carreño, kär-rān′yō, Teresa (1853), Venezuelan pianist, was born in Caracas. She received her first lessons in music from her father, and subsequently studied the piano under Gottschalk in New York, Mathias in Paris, and Rubinstein, and at an early age achieved distinction as a pianist. Before finally adopting the career of a piano virtuoso she sang in opera under Mapleson and Maurice Strakosch. She has made frequent tours of Europe and America with unqualified success. In addition to interpretative gifts of a high order, she is noted for the vigor and brilliancy of her playing. She has published numerous pieces for piano, and is the composer of the Venezuelan national anthem.

Died 1917

Carrer, kär-râr′, Luigi (1801–50), Italian poet and scholar, was born at Venice. He held the professorship of philosophy at Padua (1830) and at Venice (1844), and was subsequently appointed custodian of the Museo Correr in the latter city, a post which he held till his death. He published several volumes of poetry, his lyrical pieces showing the influence of Foscolo (whose life he wrote); and introduced the ballad from Germany with much success, his *L'Anello di Sette Gemme* (1838), which relates the picturesque story of Venice and her customs, being still popular. As an editor of various Italian classics—Petrarch, Boiardo, Della Casa, Bembo, Michelangelo—Carrer did valuable work. From 1836 to 1838 he superintended the publication of *Il Novellista Contemporaneo Italiano e Straniero*. Consult Sartorio's *Luigi Carrer*.

Carrera, kär-rā'rä, José Miguel de (1785–1821), Chilean soldier, was born in Santiago de Chile, studied in Madrid, and served in the Spanish army against the French, rising to the rank of major. At the outbreak of the Chilean revolution he returned to that country (1810), and became a member of the junta. In December, 1911, he deposed the newly formed congress and proclaimed himself president and dictator of Chile; but two years later was himself deposed in favor of Bernardo O'Higgins (q. v.). After the Chilean defeat at the Battle of Rancagua (1814) Carrera sought refuge in Buenos Ayres, and from there made his way to the United States. Returning to Buenos Ayres in 1816, he organized a guerilla force, and engaged in petty warfare until he and his two brothers, Juan and Luis, were captured and executed by the Spaniards at Mendoza in 1821.

Carrère, ka-râr', John Merven (1858–1911), American architect, was born in Rio de Janiero of American parentage, and studied architecture at the Ecole des Beaux-Arts, Paris. In 1884, with Thomas Hastings, he formed the distinguished architectural firm of Carrère & Hastings in New York City. This firm built the Ponce de Leon and Alcazar Hotels at St. Augustine, the New York Public Library, the Harvard Club in New York, the Memorial Buildings at Yale, the Carnegie Institution at Washington; and were the consulting architects for the Office Buildings of Congress at Washington. Carrère was killed in an automobile accident.

Carrhæ, kar'ē, called Haran in the Bible, a city of Osroene, in Mesopotamia, where Crassus died, after having been decisively defeated by the Parthians, in 53 B.C.

Carriage Dog. See Dalmatian Dog.

Carriages, wheeled vehicles of various types, intended for the conveyance of passengers. As generally used in the United States, the term does not include motor driven vehicles (see Motor Cars) or railway coaches. The earliest carriages were probably constructed for warlike purposes; but at the period as remote as the time of Joseph, carriages were used also for royal pageants (Gen. xli. 43). Among the Greeks, chariot races formed an important feature in the Olympic Games; the Romans had two, three, and four horse chariots; and according to Herodotus, the Scythians had a covered chariot the top of which was removable, and capable of being used as a tent.

In modern times, the earliest record belongs to about the year 1280, when Charles of Anjou entered Naples, and his queen rode in a caretta or a small decorated car. Soon thereafter, in 1294, Philip of France issued an edict prohibiting the wives of citizens from using cars or chars, and later Pius IV. (1559–66) exhorted his ecclesiastics to discountenance the womanly fashion of riding in coaches.

In Great Britain carriages came into general use much later than on the Continent, the litter being the chief state vehicle until the sixteenth century. One of the first carriages was built in 1555 by Walter Rippon for the Earl of Rutland, and subsequently the same builder made carriages for Queen Mary (1556) and Queen Elizabeth (1564). By the beginning of the seventeenth century the use of the pleasure carriage in England was well established; coaches were introduced in 1605; and the stage coach made its appearance in 1640. The early carriages were heavy, lumbering structures, necessarily of considerable strength and solidity because of the wretched roads. Later the coach body was suspended by leather straps to insure ease of motion, and still later these straps were attached to C springs, an arrangement even now used in coaches proper.

In the *United States* the earliest carriages were brought from England, and were practically all intended for public conveyances. The carriage built for General Washington by Clarke of Philadelphia, which is still extant in that city, is an excellent specimen of the later and more elegant private carriage of the eighteenth century. It had a well-hung body, with two lamps in front, green Venetian blinds, a box below the coachman's seat for holding tools, and a footboard behind, on which the lackeys stood. The era of turnpike building and the opening up of the West and South, from about 1825 onward, furnished a great stimulus to carriage building. New shapes and designs were introduced; lighter and cheaper vehicles came into use; and the construction of bodies, wheels, and other parts gradually became specialized.

Manufacture.—A plentiful supply of well-seasoned timber is the first essential for carriage building. A strong, tough, elastic wood, as ash, is used for the framework of the body, mahogany for panels, white pine for roof, oak or hickory for the spokes of wheels and elm for the hubs, lancewood for shafts, and elm, birch, and whitewood for footboards, seats, and varnished work. The wood is stored in a warm, dry place, and care is taken to avoid warping. Springs are made from the best steel, specially prepared for the purpose; axles from wrought iron, composed of a number of thin rods twisted and welded together into one bar.

In the manufacture of a carriage there are seven distinct branches, besides such subsidiary trades as supply the axles and springs, lamps, paint, and varnish: (1) body makers concern themselves only with the body, the most conspicuous and costly part of the vehicle; (2) carriage makers construct and erect the under-frames, springs, and shafts; (3) wheel makers construct the wheels; (4) smiths shape the iron joint plates; (5) visemen fix and adjust these plates; (6) painters are responsible for the decoration of the outside of the carriage, and (7) trimmers for its inner appointments.

The body of the carriage is first drawn to full size in elevation, usually on a canvas stretched along the side of the workshop; from this the 'cant boards' are prepared, showing the curves of the body as presented in end elevation and plan; and finally a complete series of working drawings, showing all details and dimensions, are made for the guidance of the body makers. The carriage makers have details similarly worked out for them from one general design, thereby insuring the harmony of the whole structure.

Wheels are made almost entirely by machinery, the only hand operations being the shrinking on the red-hot iron tire, and the fitting of bushes or 'boxes' to the extremities of the axles. The spokes are mechanically shaped and polished, and fitted radially into the machine-turned hub.

The painting of a carriage is a most important operation. The best coaches receive as many as twenty to thirty coats of oil paint; and the polishing processes are numerous and carefully conducted. The carving, gilding, decorative painting, lace and fringe work, metal ornamentation, etc., are among the best examples of their respective handicrafts.

Carriages vary in a great number of ways, the most important being in the number of wheels, the method of entering, the seating of the vehicle, the nature of the covering whether enclosed or partially enclosed, the number of persons it is designed to accommodate, and the arrangements for horsing. Important types are the coach, landau, landaulet, victoria, barouche, brougham, waggonette, phaeton, buggy, surrey, sulky, dogcart, and gig.

Statistics.—According to the Federal Census of Manufactures for 1909, there were in the United States 5,492 establishments engaged in the manufacture of carriages, wagons, sleighs, and sleds, with a capital of $175,473,728, and products valued at $164,420,558, of which $159,892,547 represented carriages and wagons. Pleasure carriages numbered 828,411, valued at $47,754,118.

See Coaching; Driving. Consult R. Strauss' *Carriages and Coaches* (1912).

Carriages, Gun. See Guns.

Carrick, borough, Allegheny county, Pennsylvania; 3 miles from Pittsburgh. It is in a bituminous coal mining district. It was incorporated from part of Baldwin town in 1904. Pop. (1910) 6,117.

Car'rickfer'gus, seaport, county Antrim, Ireland, on the north side of Belfast Lough; 10 miles northeast of Belfast. Its chief feature is its picturesque castle, which stands on a rock 30 feet high, and is now occupied as an arsenal. Here William III. landed seventeen days before the Battle of the Boyne. Flax spinning, cotton and linen manufacture, and oyster fishing are the chief industries. Pop. (1901) 4,208; (1911) 4,608.

Car'rickmacross', market town, county Monaghan, Ireland; 25 miles southeast of Monaghan. Lace making is the chief industry. Pop. 5,300.

Carrick-on-Suir, shōōr, town, Tipperary, Ireland, on the Suir; 14 miles east of Clonmel. There are manufactures of linen and wool and slate quarries. A stone bridge connects with Carrickbeg, which has an abbey dating from 1336. Pop. (1911) 5,235.

Carrier, or Common Carrier, in the legal sense, is one who offers to convey passengers or goods for hire. Unless all the available space in his conveyance is already taken up, he is not entitled to refuse any one who offers himself as a passenger, or his property as goods for transit. Exception is made, however, where the intending passenger is in a filthy or intoxicated condition, so as to render himself objectionable to other passengers or spoil the furnishings of the conveyance, or where the goods offered are dangerous in their nature or improperly packed and secured. The carrier has a right to demand prepayment of the hire, and has a lien on goods for such charges as have not already been met.

All modern systems of law, following that of Rome, impose special responsibilities on carriers. At common law a carrier is absolutely liable for any loss or injury that may occur in the course of transit, otherwise than by act of God—*e.g.*, storms and earthquakes—or of the public enemies. In most jurisdictions special statutes prevent him from contracting out of this liability, but allow special conditions to be laid down for the carriage of valuable property and live stock; if these conditions are not complied with, the carrier's liability is restricted. Responsibility as a carrier usually begins when the goods are delivered to him, and continues until a reasonable time after their arrival at the destination agreed upon.

The responsibility attaching to persons who engage privately to convey persons or goods, gratuitously or for hire, is much less than in the case of those who hold themselves out as common carriers. A gratuitous carrier is not liable except for intentional misconduct or gross negligence, while a private carrier for reward is only liable when it is proved that he has not acted up to the standard of duty and care which may reasonably be expected of an ordinarily prudent man.

In recent times the great growth of commerce and the formation of trusts (q. v.) which aim at securing monopolies (q.v.) have necessitated legislation prohibiting carriers from unduly favoring certain traders or districts, to the prejudice of others. Otherwise a trust or combination might induce or compel, by means of subsidies or threats, railroad and steamship companies to impose prohibitory rates on their competitors. Accordingly, by the Interstate Commerce Acts Congress has forbidden carriers to discriminate between persons or localities in the conveyance of passengers or goods from State to State, and has compelled them to charge only such rates as are fair and reasonable; and the Interstate Commerce Commission has power to hear complaints affecting interstate transit, and provide remedies for the same (see Interstate Commerce Commission). Each State has full control of the means of conveyance within its own jurisdiction, including the power to check abuses of the nature just mentioned. Oversea transit is subject to the jurisdiction of the Federal Government. See Bill of Lading.

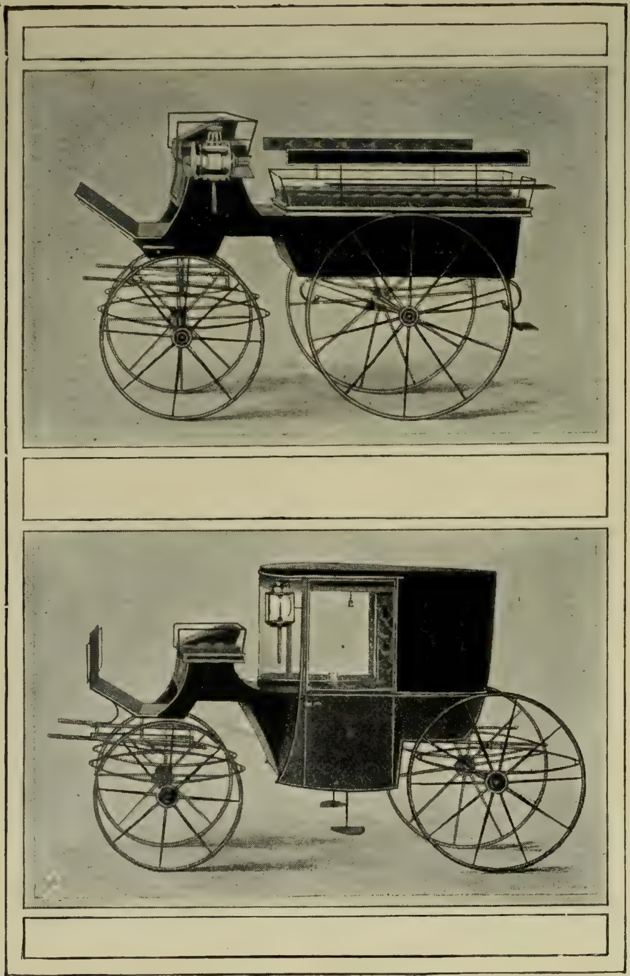
Carrier, kär-yā', Jean Baptiste (1756–94), member of the French National Convention, was born at Yolet, Auvergne. Entering the Convention in 1792, he took an active part in the formation of the Revolutionary Tribunal, voted for the death of the King, demanded the arrest of the Duke of Orleans, and assisted in the overthrow of the Girondists. At Nantes, whither he was sent on a mission against the moderates in 1793, he found ample means for indulging his insatiable thirst for human blood. The utter defeat of the Vendéans had filled the prisons with captives, and Carrier proposed and carried a resolution for murdering the unhappy prisoners *en masse.* In these massacres the form of trial was discontinued; and in four months 16,000 persons perished. Even Robespierre was offended by the enormities committed, and recalled Carrier, who boldly justified his own conduct before the Convention. The fall of Robespierre, was soon followed by outcries against Carrier; and he perished under the guillotine.

Carrière, kär-yâr', Eugène Anatole (1849–1906), French painter, born at Gournay (Seine-Inférieure). He was a great painter of maternity—not of the Madonna, but of the mother absorbed in the care of her children. He worked at Vaugirard through many years of non-recognition. A consummate draughtsman, he painted as a sculptor works; and in order to emphasize the inner life, he isolated the figure by enveloping it in a soft haze. His famous *Maternity* (1892) is in the Luxembourg at Paris, *The Young Mother* (1878) at Avignon, and *The Sick Child* (1886) at Montargis. Among other remarkable pictures are *Théâtre de Belleville* (where he discloses the mind of the audience); his portraits of Daudet, De Goncourt, Verlaine, Anatole France, Reclus, Henri Rochefort, and Metchnikoff; *Christ on the Cross* (1897); and a decorative panel at the Sorbonne.

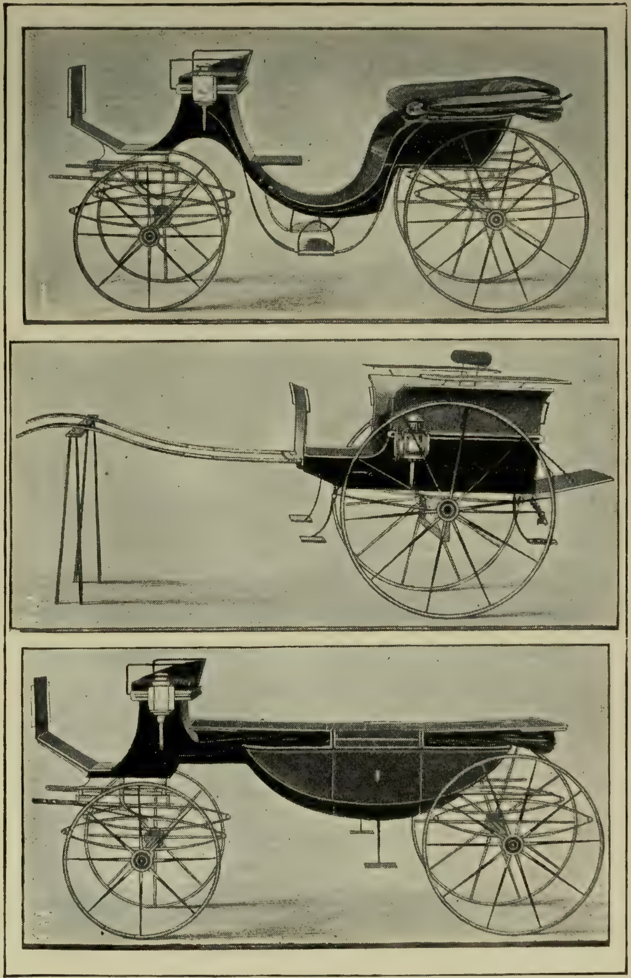
Carriere, Moriz (1817–95), German philosopher, born at Griedel, near Butzbach, in Hesse-Darmstadt. In 1853 he was appointed professor of esthetics at Munich. His philosophy is an attempt to reconcile deism and pantheism, and maintains the ultimate triumph of the beautiful and the good. His works embrace: *Aesthetik* (3d ed. 1884); *Die Kunst . . . und die Ideale der Menschheit* (3d ed. 1876–86); *Jesus Christus und die Wissenschaft der Gegenwart* (2d ed.1889); *Die Sittliche Weltordnung* (2d ed. 1891); *Die Philosophische Weltanschauung der Reformationszeit* (2d ed. 1887).

Carrier Pigeon. See Pigeon.

Carrington, Charles Robert Wynn-Carrington, First Earl of (1843), was educated at Cambridge, and sat in the House of Commons as Liberal member for High Wycombe (1865–8), until he became third Baron Carrington, in succession to his father. He was governor of New South Wales (1885–90), and lord chamberlain (1892–5); and was appointed president of the Board of Agriculture in the Campbell-



1. Wagonette. 2. Brougham.



1. Victoria. 2. Polo Cart. 3. Landau

CARRIAGE BUILDING: MODERN TYPES OF CARRIAGE.

Bannerman ministry formed in Dec., 1905.

Carrington, Henry Beebee (1824), American soldier and author, born at Wallingford, Conn. He graduated at Yale in 1845 and at the Yale Law School in 1847; practised law at Columbus, O. (1848–61); served on the Federal side in the Civil War, rising to the rank of brigadier-general of volunteers (commissioned Nov., 1862); later took part in operations against the Sioux Indians, and in 1870 retired from the army. Among his publications are: *Russia as a Nation* (1849), *American Classics, Battles of the American Revolution* (1876; last ed. 1903), the best work on the subject; *The Six Nations of New York* (1892), a census bulletin of the Eleventh U. S. Census, *Washington the Soldier* (1898), *Lafayette and American Independence*, etc.

Died 1912

Carrington, Richard Christopher (1826–75), English astronomer, born at Chelsea; equipped an observatory at Redhill, Surrey, in 1853, and completed in 1857 a *Catalogue of* 3,735 *Circumpolar Stars.* His observations of sun spots, and discovery of the composite law of solar rotation, were published in 1863.

Carrion Crow (*Corvus corone*), a European crow, a close ally of the hooded crow (*Corvus cornix*), with which it is stated to interbreed. It differs from the latter in the uniform shimmering black plumage. In the United States the name is given to a black vulture (*Catharista atrata*), smaller than the turkey buzzard, which performs scavenging work in the towns along the Gulf of Mexico.

Carrion Flowers, or Stapelias, are members of a genus of S. African succulent plants belonging to the order Asclepiadeæ. They derive their popular name from the odor of their flowers, which are usually showy and frequently beautiful. The plants are leafless, and the stems are quadrangular, with teeth projecting from each edge. They are grown in a mixture of light loam, sand, and broken brick in equal proportions, and are easily propagated by means of cuttings. The species are very numerous, a few of the best being the following: *S. gigantea* has yellow flowers, covered with silky purplish hairs; *S. grandiflora* has dark purple blossoms, streaked with white, and is hairy. The carrion flowers are sometimes spoken of as the African toad-flowers. In the United States the name is given to a species of Smilax (*Smilax herbacea*). It is a climbing, thornless plant, with evil-smelling, globular heads of greenish flowers.

Carrizal Bajo, seapt., Atacama prov., Chile, 130 m. N. of La Serena. The chief industry is copper smelting. Pop. about 2,500.

Carroccio, a large chariot or van on which, in the middle ages, the banner of an Italian town was carried into battle. It was painted red, and had in the middle a red pole with a golden apple at the top, into which the flag was fixed. This was regarded as the palladium of the city. The originator of the practice is reputed to have been Aribert, archbishop of Milan, when his city was being besieged in 1038 by order of the Emperor Conrad II. The carroccio of Milan was lost in the battle of Corte Nuova (1237) against the Emperor Frederick II. The battle of the Standard, near Northallerton in England (1138), owed its name to a standard planted by the Scots on a carroccio or wagon, after the Italian fashion.

Carroll, city, Ia., co. seat of Carroll co., 73 m. N.W. by W. of Des Moines, on the Middle Coon R. and on the Chi. and N.W. and the Chi. Gt. W. R. Rs. It is an agricultural centre and shipping point with some manufacturing interests. Pop. (1910) 3,546.

Carroll, Charles, of Carrollton (1737–1832), American patriot, born at Annapolis, Md., of Irish-Catholic descent. He was educated in Europe, partly in Jesuit colleges at St. Omer, Rheims, and Paris, and partly at the Temple, London; returned to Md. in 1765, and in the pre-Revolutionary controversies between the British government and the American colonists became one of the leaders of the latter, attracting particular attention by a series of articles signed 'First Citizen,' which in 1773 he contributed to the *Maryland Gazette*, and in which he vigorously opposed arbitrary taxation. His course was the more noteworthy because he was at that time probably the wealthiest man in America, and a majority of the men of especial wealth were naturally conservative and ultimately joined the Loyalists rather than the Whigs. During the Revolutionary War he was a member of the Continental Congress (1776–79), signing the Declaration of Independence (Aug. 2, 1776); and in 1776, with Benjamin Franklin and Samuel Chase, was sent by the Continental Congress to gain the good-will and, if possible, the coöperation of Canada, the mission, however, accomplishing nothing. He was a member of the Md. Constitutional Convention (1776) and of the Md. Senate (1777–1800). From 1789 to 1791 he was a Federalist member of the U. S. Senate. He was the last survivor of the signers of the Declaration of Independence. The phrase 'of Carrollton' generally attached to his name was adopted by Carroll himself after coming into possession, about 1765, of the estate known as Carrollton in Md., the statement frequently made that he added the phrase to his name for the first time (to distinguish himself from other Charles Carrolls) when signing the Declaration being almost certainly erroneous. See Rowland's *Life of Charles Carroll of Carrollton, with his Correspondence and Public Papers* (2 vols., 1898).

Carroll, Henry King (1848), American journalist and author, was born at Dennisville, N. J. From 1876 to 1898 he was religious and political editor of the *Independent*, and he conducted the census of churches for the 11th U. S. Census (1890). He was a special U. S. Commissioner to Porto Rico, 1898–9, and in 1900 became corresponding secretary of the Methodist Episcopal Church Missionary Society. He published *The Religious Forces of the United States*, and various government reports and other papers.

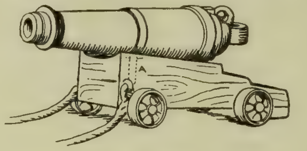
Carroll, John (1735–1817), American R. C. prelate, a cousin of Charles Carroll of Carrollton, was born at Upper Marlborough, Md., and, affiliating himself with the Society of Jesus, studied in Flemish and French Jesuit colleges. He was ordained a priest at Liège in 1759, and was professor of moral philosophy at St. Omer and Liège until 1771. On the suppression of his order by the Pope in 1773, he removed to England, whence he returned (1774) to America to take part with his Roman Catholic kinsmen, the Carrolls of Maryland, in that colony's struggle against the Crown. He took an active part in the Revolution, was commissioner to the Canadian Roman Catholics (though not successful in this mission), and after the declaration of peace was, in 1784, made superior of the Roman Catholic clergy in the U. S. On the establishment of the bishopric of Baltimore, he was chosen first Bishop of the diocese, and was consecrated in England (1790). He was sole bishop in the U. S. for many years, and in 1808 he was created archbishop, with jurisdiction over four sees, including Maryland, Virginia and other Southern States to the Gulf of Mexico. He founded Georgetown College (1781) and a great number of other R. C. institutions, and built the Cathedral of Baltimore. His writings were chiefly of a controversial character. See Shea's *Life* (1888).

Carroll, Lewis—pseudonym of Charles Lutwidge Dodgson (1832–98)—English mathematician and writer of fairy tales, born at Daresbury, Cheshire; educated at Christ Church, Oxford, of which he became a mathematical lecturer (1855–81). His Oxford life was almost that of a recluse, but he delighted in the society of little girls. In the affairs of the university he interested himself to the extent of an occasional witty pamphlet. Six of these were published between 1865 and 1874, and are collectively known as *Notes by an Oxford Chiel.* His mathematical speculations were ingenious rather than profound. He delighted in the invention of games and puzzles. He published *Alice's Adventures in Wonderland* in 1865. The verbal felicities and whimsical logic of this, aided by Tenniel's clever drawings, proved attractive both to children and to their elders. It was followed by *Through the Looking-glass, and what Alice found there* (1871), and by some other attempts of less account. Lewis Carroll was also responsible for a good deal of humorous verse, of which *The Hunting of the Snark* (1876) is the best. Other works: *Curiosa Mathematica* (1883–93), *Principles of Parliamentary Representation* (1884), *Symbolic Logic* (1896), *Sylvie and Bruno* (1889), *Sylvie and Bruno Concluded* (1893). See S. D. Collingwood's *The Life and Letters of Lewis Carroll* (1898); Isa Bowman's *The Story of Lewis Carroll* (1899).

Carrollton. (1.) City, Mo., co. seat of Carroll co., 61 m. E.N.E. of Kansas City, on the A., T. and S. Fe, the Chi., Burl. and Quincy, and the Wabash R. Rs. Its manufactures include furniture, wagons, textiles, flour, cigars and tiles. Pop. (1910) 3,452. (2.) City, Ill., co. seat of Carroll co., 50 m. N. by W. of St. Louis, Mo., on the Chi. and Alt. and the Quin., Carroll. and St. Louis R. Rs. It has a foundry, machine shops, canneries, and flour mills. Pop. (1910) 2,323. (3.) City, Ky., co. seat of Carroll co., 44 m. N.E. of Louisville, on the Ohio at the mouth of the Ky. R., on several lines of river packets and accessible to the Louis. and Nash. R. R. at Worthville. It is a shipping point for tobacco and manufactures lumber, furniture, flour, textiles, etc. Pop. (1910) 1,906. (4) A suburb, now incorporated in New Orleans, La.

Carron, vil., Stirlingshire, Scotland, on riv. Carron, 1½ m. N.W. of Falkirk; noted for its extensive iron works, founded by Dr. Roebuck of Sheffield in 1760. At one time it was famous for the manufacture of cannon and shot, hence the name 'carronades.' Pop. (1901) 1,942.

Carronade (from Carron—see above—where the weapon was first made), originally called 'smasher,' a short piece of ordnance in use at sea in the latter days of wooden ships. It was adopted in the British service in June, 1779. Carronades were made in several sizes, varying from the 12-pounder of 2 ft. 2 in. long to the 32-pounder of 4 ft. 0½ in. long. Large carronades, 68-pounders, were ultimately adopted, and were 5 ft. 2 in. long, and weighed 36 cwt., with a calibre of 7.702 in.



Carronade.

Carron Oil, a mixture of equal parts of lime-water and linseed oil, is used as an application for burns, and takes its name from the Carron Iron Works, where it was formerly much in favor among the workmen. See BURNS.

Carrot. The carrot derives its origin from the wild species *Daucus Carota.* It is a member of the order Umbelliferæ. In order to grow well, carrots should be provided with a light, moderately rich, deeply cultivated soil. Manure should not be added at or immediately before the time of sowing, but a heavy dressing should have been applied for the previous crop. Plant in early spring as soon as weather conditions permit. The seeds should be sown in drills about 12 inches apart, the carrots being afterwards thinned out so that four inches are allowed to each root in the row. The main field crop may be sown in May or up to the middle of June, eighteen inches being allowed between the drills and four inches between the plants in the row. Cover the seed about 1 inch deep. The plant makes its best growth in cool fall weather. The roots should be pulled before the ground freezes, the tops cut off and the crop stored like potatoes either in the cellar or in pits out of doors. Some of the small half long sorts are best for early use. The long White Belgian and Orange are good field sorts. Carrots make excellent stock feed, especially for horses and dairy cows, but the cost of growing is considerably greater than for mangles.

Carruthers, ROBERT (1799–1878), Scottish journalist, born at Dumfries. In 1828 he became editor of the *Inverness Courier*, and conducted it until his death. Carruthers's publications include *Hist. of Huntingdon* (1824); *Poetry of Milton's Prose* (1827); Boswell's *Tour to the Hebrides*, with notes (1851); editions of Pope's poems (1853 and 1858); *The Life of Alexander Pope, with Extracts from his Correspondence* (1857). He collaborated with Robert Chambers on his *Cyclopædia of Eng. Lit.* (1843–4) and with William Chambers on his Bowdlerized *Household Edition of Shakespeare* (1861–3), and to the eighth edition of the *Encyc. Brit.* contributed several biographies. See *Memoir of William and Robert Chambers* (13th ed. 1884); Memoir prefixed to Thomas Aird's *Poetical Works*, edited by Rev. Jardine Wallace (1878).

Carruthers, WILLIAM A. (*c.* 1800–*c.* 50), American novelist, was born in Virginia, and studied at Washington College, Va. He became a physician, and practised at Savannah, Ga. His description of an ascent of the natural bridge in Virginia, in the *Knickerbocker Magazine* for 1838, was long a favorite piece for recitation by schoolboys. His works of fiction include *The Cavaliers of Virginia* (1832) and *The Knights of the Horse-Shoe* (1845).

Carson, CHRISTOPHER (1809–68), American hunter, scout, and frontiersman, generally known as Kit Carson, born in Madison co., Ky. In 1810 he was taken by his parents to Howard co., Mo., then sparsely settled, and at the age of seventeen he became a hunter, trapper, and professional guide. He acted as guide to Frémont in his exploration in the Rocky Mts. (1842–4), served under him during the conquest of California (1846–7), conducted parties overland to California during the rush of 1849–50 to the newly-discovered gold fields, and, settling in New Mexico in 1854, became U. S. Indian agent at Taos, and was breveted brigadier-general for services rendered there, chiefly as a scout, during the Civil War. He died at Fort Lynn, Col. See *Lives* by Burdett (1859) and Peters (1874).

Carson City, cap. of Nev., co. seat of Ormsby co., 12 m. E. of Lake Tahoe at the base of the Sierra Nevada, on the Virginia and Truckee R. R. Here are the famous Comstock Lode and other mines of gold and silver. It is the seat of an Indian school and a U. S. mint. Lumbering is an important industry. Hot springs occur in the vicinity. There is a splendid view of the snow clad mountain peaks. Pop. (1910) 2,466.

Carson River, river in Nevada. It rises in the Sierra Nevada, traverses parts of Ormsby, Lyon and Churchill cos. and terminates in Carson Lake after following a general N.E. course of 170 m.

Carstares, kär′stârz, William (1649–1715), Scottish statesman and divine, was born near Glasgow. He studied at Edinburgh and subsequently at Utrecht, where he came to the notice of William of Orange. In 1674 he was arrested in England, for supposed complicity in the authorship of a pamphlet on *Scotland's Grievances*, was thrown into Edinburgh Castle, and there he lay untried until his release in 1679. From that time onward he was one of the principal agents in bringing about the advent of the Prince of Orange. He took a leading part in the organization of the proposed rising in which Shaftesbury, Russell, and Argyll were the chief actors, but did not approve of the Rye House plot, on the discovery of which he was captured at Tenterden, Kent (1683), and was once more sent to prison. Returning to Holland, Carstares was appointed second minister of the Scottish congregation at Leyden and chaplain to William. He accompanied the Prince to England in 1688, and William thenceforward relied implicitly on him so far as the government of Scotland was concerned. The revolution settlement which established the Scottish Presbyterian Church was chiefly the result of his efforts, but patronage was abolished against his advice. In 1703 he was appointed principal of Edinburgh University, and in the same year he became minister of the Greyfriars' Church, Edinburgh. He continued in the office of royal chaplain under Anne and George I., and was four times elected moderator of the General Assembly (1705, 1708, 1711, 1715). He was an active promoter of the union. Consult R. H. Story's *Life of Carstares*, and *The Carstares State Papers.*

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Cartagena, Colombia: Columbus Square, a Typical Street, with Living Quarters Above and Stores on the Street Level

Carstens, kär′stens, Asmus Jacob (1754–98), Danish painter, the initiator of the classical reaction in Germany, was born near Schleswig. Influenced by Winckelmann, he conceived an admiration for Hellenic ideals, and rebelled against the rococo school and academic traditions. His ideas were met by violent opposition, and, hampered by poverty, he supported himself by portraiture, until, in 1787, he obtained a professorship at the Academy, Berlin; this enabled him to go to Rome, where he studied Michelangelo and Raphael. In his pictures, almost all classical in subject, he laid stress on beauty of line, practically to the disregard of color. The ducal collection at Weimar is rich in his drawings, and there are many also at Copenhagen and Berlin. His *Argonaut* cycle has been engraved in twenty-four plates.

Cartagena, kär-th*a*-jē′n*a*; Sp. kär-tä-hä′nä, city, Spain, in the province of Murcia; 240 miles southeast of Madrid. It is a strongly fortified town, the chief naval harbor of Spain. Two forts, crowning high cliffs, protect the harbor, which is sheltered on the southeast by the island of Escombrera. Features of interest in the city are the ruins of the old mediæval cathedral, the church of Santa Maria de Gracia, and the arsenal. The chief industries are shipping and lead smelting and desilverizing. Pop. (1920) 101,613.

Cartagena was founded by Hasdrubal in 221 B.C., on the site of an ancient Iberian settlement. It was conquered by Scipio in 209 B.C., and for centuries was an important commercial port. It came into Spanish possession in the thirteenth century. In the war of the Spanish Succession it was taken by an English-Dutch fleet (1706). During the political troubles in the latter part of the reign of Isabel II., Cartagena was one of the most stubborn of the revolting cities; it was forced to surrender, after a long siege, in 1874.

Cartagena, seaport town, Colombia, capital of the department of Bolivar, is situated on an island in Cartagena Bay. It is one of the oldest settlements in Spanish South America and still retains much of its old-time appearance. Notable features are the magnificent cathedral, archiepiscopal palace, several modern hospitals, and a fine theatre. It is the seat, also, of a university and the national normal school. Industrial establishments include textile works, sugar, chocolate, soap, hat, shoe, and straw factories, and flour mills. Pop. (1918) 51,382. (For illustration see page 555.)

Cartagena was founded by Pedro de Heredia in 1533. It was frequently sacked and plundered, notably by Drake in 1585, and by the French in 1697. In 1815 it was the headquarters of the South American Inquisition.

Cartago, kär-tä′gō, town, Colombia, capital of the province of Cartago, near the Rio Vieja; 130 miles west of Bogota. It is in an agricultural region and produces coffee, tobacco, and cocoa. Pop. 18,000.

Cartago, town, Costa Rica, Central America, in the province of Cartago, on the railroad which connects the Atlantic and Pacific coasts; 12 miles southeast of San José. It lies dangerously near the base of the active volcano of Irazu or Cartago (11,200 ft.). The chief products are coffee and tropical fruits. Cartago is the seat of a college and was the capital of the country until 1823. It has suffered seriously from earthquakes, being practically destroyed in 1823 and again in 1910. Pop 18,599.

Carte, a position in fencing, in which the inside of the hand is turned upward and the point of the foil is toward the adversary's right breast.

Carte, Richard d'Oyly (1845–1901), British theatrical manager, notable for his intimate connection with Sir Arthur Sullivan. He turned his attention to comic opera in 1870, and in 1877 made his fame by the production of *The Sorcerer* at the Opéra Comique, London. With the profits from this and other Sullivan operas he built the Savoy Theatre, London. His attempt to establish a Grand English Opera House (now the Palace Theatre) in London proved disastrous.

Carte, Thomas (1686–1754), English historian, was born in Clifton-upon-Dunsmore. He was educated at Oxford (B.A. 1702), and at Cambridge (M.A. 1706), and having taken holy orders, became reader in Bath in 1707. He was an ardent Jacobite and on that account was often in trouble with the government. Having refused to take oaths of allegiance to George I., and being suspected of complicity in the Atterbury conspiracy in 1722, he was forced to escape to France, where he lived under the name of Phillips. He returned to England in 1728 and devoted himself to writing. His published works include *Life of James, Duke of Ormonde* (2 vols., 1736), *History of England to 1654* (4 vols., 1747–55), and many pamphlets and translations. He also left a valuable collection of historical material brought together during his lifetime.

Carte Blanche, kärt bloṅsh, an expression meaning unlimited authority. Literally, it is a blank paper, duly signed, intrusted to a person to fill out at his discretion.

Cartel′, a ship commissioned in time of war to exchange the prisoners of any two hostile powers, or to carry proposals from one to another. With the exception of a single gun for making signals, no arms, ammunition, or materials of war are carried on board.

In Germany and Austria the term cartel signifies a combination among producers, as of sugar, coal, and iron, relative to prices and output. The producers who enter into a cartel usually bind themselves to limit their sales to a particular locality; frequently also they agree upon minimum prices and upon the amount of product to be placed upon the domestic market. When the domestic prices seem to be forced down by overproduction, the members of a cartel may form a fund to meet the loss caused by selling part of the supply in foreign markets at whatever price may be obtainable.

Unlike the analogous American combination (see Trusts), cartels are upheld by the laws of Germany and Austria. Agreements to limit production and to fix prices are enforced by the courts, so long as extortionate prices do not result. Consult Hirst's *Monopolies, Trusts and Kartells.*

Carter, Elizabeth (1717–1806), English poet and scholar, was born in Deal. She mastered Greek and Latin, Hebrew, French, German, Italian, Spanish, and Portuguese, and made some study of Arabic. She translated *Epictetus*, and published two volumes of *Poems*. Samuel Johnson, Horace Walpole, Edmund Burke, and other notables were among her friends.

Carter, Franklin (1837–1919), American educator, was born in Waterbury, Conn. He studied at Yale, Williams, and the University of Berlin, was professor of French and Latin (1865–8) and of Latin alone (1868–72) at Williams, and of German at Yale (1872–81). In 1881 he was elected president of Williams College, a position which he occupied until 1901. He was also president of the Clark School for the Deaf (1896–1919). His publications include *Life of Mark Hopkins* (1892) and an edition of Goethe's *Iphigenie auf Tauris* (1879).

Carter, Henry, the real name of Frank Leslie (q. v.).

Carter, Henry Rose (1852–1925), American public health official, was born in Caroline county, Va. He was educated at the University of Virginia and at the Medical School of the University of Maryland, and in 1879 entered the U. S. Public Health Service as assistant surgeon, becoming assistant surgeon general in 1915. He has devoted himself particularly to sanitation in connection with yellow fever and malaria. He inaugurated a quarantine system in Cuba in 1899–1900, was director of hospitals in the Panama Canal Zone (1904–09), a member of the Rockefeller Yellow Fever Commission to Central and South America (1916), and sanitary advisor of the Peruvian Government (1920–21). He is a member of the Yellow Fever Council, International Health Board of the Rockefeller Foundation. His publications include many reports and articles for medical journals and other publications.

Carter, Howard (1873–   ), British archæologist and Egyptologist, was born in Swaffham, Norfolk. He was educated privately, studied art, and in 1891 began his work as an archæologist under Professor Petrie in Egypt, assisting in the Tel-el-Amara excavations. From 1900 to 1905 he was government inspector-in-chief of Egyptian antiquities in Upper Egypt. He conducted extensive explorations in the Valley of the Kings, making many valuable discoveries, and in 1917 joined Lord Carnarvon in his Theban explorations which led to the finding (1923) of the tomb of Tut-ankh-amen (q. v.). In 1924 he visited the United States, giving a series of illustrated lectures on his discoveries.

Carter, James Coolidge (1827–1905), American lawyer, was born in Lancaster, Mass. He was graduated from Harvard (1850) and from the Harvard Law

School (1853), and was admitted to the New York bar. Governor Tilden appointed him a member of the commission to devise a form of municipal administration for cities in New York (1875), and Governor Hill made him a member of the constitutional commission of 1888. In 1892 he was named by President Harrison, with Edward J. Phelps and Henry W. Blodgett, counsel to present the claims of the United States before the Bering Sea tribunal which met in Paris the following year. He published several addresses and a pamphlet on *The Codification of Our Common Law* (1883).

Carter, JESSE BENEDICT (1872–1917), American educator, was born in New York City. He was educated at New York University, Princeton, and the Universities of Leipzig, Berlin, Göttingen, and Halle, and was successively instructor, assistant professor, and professor of Latin at Princeton (1895–1907). He was director of the American School of Classical Studies at Rome (1907–12) and director of the American Academy at Rome from 1913 until his death. His publications include *De Deorum Cognominibus* (1898); *The Roman Elegaic Poets* (1900); *Epitheta Deorum* (1902); *Virgil's Æneid* (1903); *The Religion of Numa* (1906); *The Religious Life of Ancient Rome* (1911).

Carter (MRS.) LOUISE LESLIE (1862–), American actress, was born in Lexington, Ky. Her first professional appearance was in *The Ugly Duckling*, in New York, in 1890. She next appeared in the musical comedy, *Miss Helyett*, and after two years' study under David Belasco won marked success in *The Heart of Maryland* (1895), *Zaza* (1898), *Du Barry* (1901), and *Adrea* (1904). In 1907 she made a tour under her own management, adding *La Tosca*, *Vasta Herne*, *Camille*, *The Second Mrs. Tanqueray*, and other plays to her repertoire. She was absent from the stage from 1917 to 1921, when she reappeared with John Drew in *The Circle*.

Carter, SAMUEL POWHATAN (1819–91), American naval officer and soldier, was born in Carter county, Tenn. He entered the U. S. Navy in 1840, and as lieutenant, serving on the *San Jacinto*, took part in the attack on the Barrier Forts, Canton River, China, in 1856. Following the outbreak of the Civil War, he was permitted to report to the Secretary of War for special duty (July 1861), and soon afterward organized in East Tennessee a brigade which he commanded. He was commissioned brigadier-general of volunteers in May 1862, and lieutenant-commander in the navy in July 1862. In 1865, he was brevetted major-general of volunteers, and in 1866 was mustered out of the volunteer service. He then rejoined the navy, having been commissioned commander in June 1865. He was commandant of the U. S. Naval Academy from 1869 to 1872, retired in 1881, and was made a rear-admiral on the retired list in 1882.

Carter, THOMAS HENRY (1854–1911), American legislator, was born in Scioto county, Ohio. After some time spent in farming and teaching, he studied law and settled in Helena, Mont. (1882). He was delegate to Congress in 1889–91, representative in 1891–2, and U. S. Senator (Rep.) for the terms 1895–1901 and 1905–11. He was president of the U. S. commissioners of the Louisiana Purchase Exposition at St. Louis and was a member of the International Boundary Commission of the United States and Canada (1911).

Carteret, kär'tėr-et, SIR GEORGE (*c.* 1613–80), English royalist, governor of the island of Jersey, was bred to the sea, and by 1632 was lieutenant of the *Convertive*. He took the side of King Charles in the Cromwellian wars, and maintained his position as lieutenant-governor of Jersey until forced to surrender in 1651. After the Restoration he held several offices under Charles II., of which the most important was that of treasurer of the navy (1661–7). For his loyalty and services to the crown he was, in 1650, granted 'a certain island and adjacent islets in America in perpetual inheritance, to be called New Jersey, and held at an annual rental of £6 a year to the crown'; and in 1663 he appears as one of the original proprietors of Carolina. In 1664, the Duke of York assigned to him, in conjunction with Lord Berkeley, the land between the Hudson and the Delaware, to be called, in honor of Carteret, New Jersey. The district was divided in 1676, Carteret retaining the part known as East Jersey, which was bought from his widow in 1682 by William Penn and eleven other Quakers.

Carteret, JOHN, EARL GRANVILLE (1690–1763), British statesman, succeeded to the peerage on the death of his father in 1695. He was educated at Oxford, and in 1711 took his seat in the House of Lords, becoming a staunch supporter of the Protestant succession. In 1719 he was appointed ambassador-extraordinary to Sweden and was instrumental in concluding peace between Sweden, Prussia, and Hanover. He was made a secretary of state in 1721, but after an unsuccessful attempt to combat the influence of Walpole and Townshend in the same cabinet, he resigned, and in 1724 became lord-lieutenant of Ireland, a position he held with considerable popularity for six years. From 1730 until Walpole's resignation in 1742, Carteret did not cease to oppose him, and upon his resignation the latter was again made a secretary of state. He became Earl Granville on the death of his mother in 1744, and soon afterward resigned his secretaryship. Two years later he and Lord Bath were appointed to form a ministry, but resigned, after a vain attempt, at the end of four days. He still enjoyed the King's favor, however, and in 1750 was elected a Knight of the Garter. Carteret was a man of undoubted ability, quickness, and precision, a fine speaker, and endowed with many social graces, but his haughty contempt for his opponents' opinions unfitted him for successful parliamentary leadership.

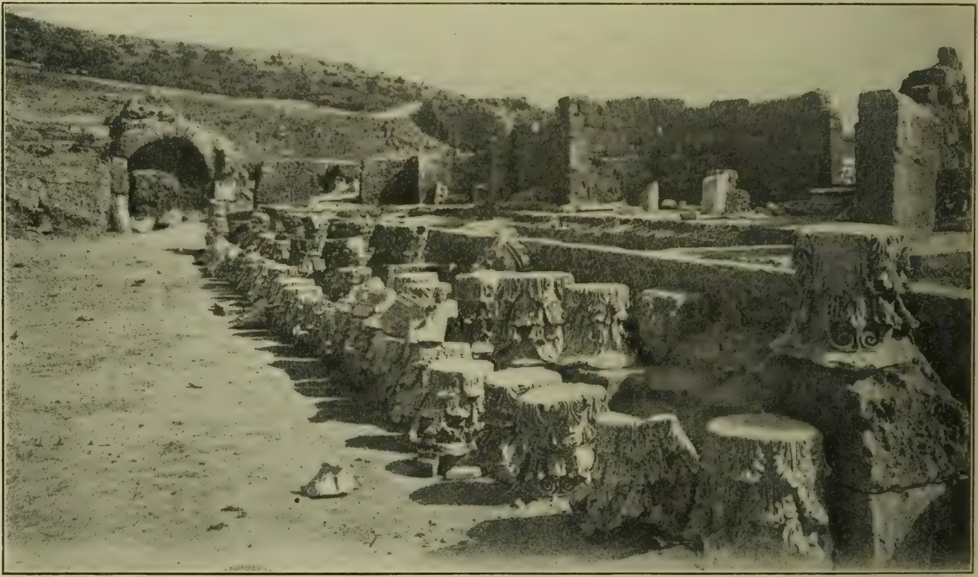
Carteret, PHILIP (? — 1796), British rear admiral and explorer, attained the rank of commander in 1766. In that year he was sent to the southern hemisphere to complete the work begun by Byron's expedition two years earlier. He discovered Pitcairn Island, Queen Charlotte Islands, New Ireland, St. George's Channel, Sandwich, Byron, New Hanover, and many other small islands, all in the South Pacific. In 1794 he retired from active service. His 'Journal' was published in Hawkesworth's *Voyages* (1773).

Carteret, PHILIP (?–1682), brother of Sir George Carteret (q. v.), was appointed by his brother and by Sir John Berkeley, lords proprietors of New Jersey, first governor of that province. He sailed for America in 1665, and founded Elizabethtown, which he named in honor of his sister-in-law. He was governor of the province until its division in 1676, after which he was governor of East Jersey until his death. He had serious difficulties with Sir Edmund Andros, governor of New York, who claimed jurisdiction over his territory, and with James Carteret, second son of Sir George, who usurped his position in 1672, but he was able finally to maintain his rights in both cases.

Cartersville, city, Georgia, county seat of Bartow county, on the Louisville and Nashville, the Nashville, Chattanooga and St. Louis, and the Seaboard Air Line Railroads; 48 miles northwest of Atlanta. The surrounding region is rich in minerals, including iron, manganese, ochre, and barytes. Cattle are raised, and cotton, wheat, and other farm products are grown. The government is of the city-manager type. Pop. (1910) 4,067; (1920) 4,350.

Carterville, city, Missouri, in Jasper county, on the St. Louis and San Francisco and the Missouri Pacific Railroads; 10 miles southwest of Carthage. Productive mines of lead and zinc are situated here. Industrial establishments include foundries, machine shops, and boiler works. Pop. (1910) 4,539; (1920) 2,434.

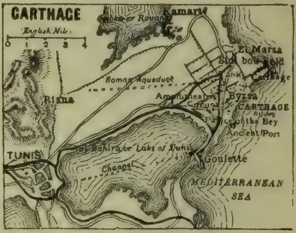
Car'thage (Lat. *Carthago;* Gr. *Karchedon*), celebrated ancient city on the northern coast of Africa; about 20 miles northeast of modern Tunis. According to legend, it was founded by Dido about 850 B.C., on a promontory at the northeastern extremity of the Bay of Tunis. The new foundation (Carthage means 'new city') grew and prospered, soon outstripping Utica, the earliest Phœnician colony in Africa. The original city was situated on a hill called Bosra, or Byrsa, afterward the citadel. There were two harbors—the inner, Cothon, for ships of war, and a larger outer one for merchant vessels. At the time of its destruction (146 B.C.), the population of Carthage numbered 700,000, many of whom were of Libyan descent. The constitution was oligarchic: there were two kings, elected annually, whose power was chiefly judicial, and a council of 28 members, also elected annually, who chose the general, and were in theory the chief governing body. The actual control of affairs rested with a board of 104 judges, who were also elected annually, but appear to have been continually re-elected, so that the office was in practice held for life. The general assembly of the people had little power.



Remains of a Roman Theatre at Carthage

Originally Carthage was little more than a trading station, maintaining peaceful relations with its neighbors, but as it grew in wealth and power it was able to subjugate and annex other Phœnician colonies, and by about 450 B.C. it had subdued many Libyans and asserted its supremacy over Hippo, Hadrumetum, Little and Great Leptis, and Thapsus: only Utica remained independent. The North African coast westward as far as the Atlantic was included in its dominion; and at the height of its power, in the third century B.C., it held also the western half of Sicily, Sardinia, the Balearic Isles, and most of Spain. Thus, at its greatest extent, the empire of Carthage encompassed nearly the whole of the Western Mediterranean.

The history of Carthage, so far as it is known to us, is chiefly the history of her struggles with Greece and Rome. In Sicily the Carthaginians received a crushing defeat at the hands of the Greeks under Gelon, at Himera, in 480 B.C., and until nearly the end of that century were confined to the western extremity of the island. In 406–05 they captured Gela, Himera, Agrigentum, and other cities; and held the western half of Sicily, until Timoleon's victory at the Crimissus, in 339 B.C., again reduced them to their ancient limits. Thirty years later they recovered their former position, which they maintained until the outbreak of their struggle with Rome.



The Site of Ancient Carthage

In the First Punic War (264–241 B.C.) Carthage lost Sicily and soon afterwards Sardinia. Hamilcar was the Carthaginian hero of this first struggle. To compensate for the losses suffered, he, with his son Hannibal and his son-in-law and successor Hasdrubal, developed the Carthaginian power (236–221 B.C.) in Spain. In 218 B.C. Hannibal began the Second Punic War, invaded Italy, and won several great battles (Trebia, Trasimenus, Cannæ). He failed, however, to disintegrate the confederacy of Rome and, leaving Italy in 203, was defeated by Scipio at Zama, Africa, in 202. By this defeat Carthage lost Spain, and indeed all her possessions outside her own immediate territory, and became the vassal state of Rome.

A Third Punic War, declared by the Romans in 149 B.C., on a flimsy excuse, resulted in the ultimate destruction of Carthage by Scipio Æmilianus in 146 B.C., and her territory became the Roman province of Africa. In her struggle with Rome, Carthage had the advantage of wealth (she was the wealthiest city of antiquity) and of generals; but her mercenary troops—a motley horde of Phœnicians, Libyans, Numidians, Spaniards, Ligurians, and Gauls—were inferior to the homogeneous Italian army of Rome.

In later time a Roman colony founded at Carthage by Julius Cæsar, and developed by Augustus, became once more the chief city of Roman Africa, and was the seat of several ecclesiastical (Christian) synods and councils. The Vandals captured it in 439 A.D., and held it until Belisarius took it and destroyed their power in 533. The Arabian conquerors finally destroyed the city in 698 A.D.

The first important excavations at Carthage were undertaken in 1837 by de la Molle. He was followed by other explorers, of whom the most notable was Father Delattre, but the work was for the most part conducted with little systematic plan. In 1921 Count de Porok, a French archæologist, began work in Carthage, and this work has been carried on by him and by American archæologists. Among the most important recent discoveries is the Temple of the goddess Tanit, dedicated to her worship and that of the god Baal Ammon. Sacrificial urns found on the site containing the bones of children indicate that human sacrifices formed an important part of Carthaginian worship. A number of Punic tombs of about 700 B.C. were also excavated, and a large deposit of Punic incense burners of about 400 B.C. was laid bare. Extensive Roman remains have also been discovered, including beautiful mosaics, numerous Latin inscriptions, coins, pottery, jewels, and glass, a Roman theatre, baths, and villas. As a result of these recent discoveries archæologists are convinced that the ancient Punic city and the Roman Carthage occupied slightly different sites.

Consult Church's *Carthage* in the 'Story of the Nations Series'; N. Davis' *Carthage and her Remains;* Boissier's *Afrique Romaine;* Petrie's *Tunis, Kairouan and Carthage;* Grant's *Studies in North Africa* (1921).

Carthage, city, Illinois, county seat of Hancock county, on the Chicago, Burlington and Quincy and the Wabash Railroads; 13 miles east of Keokuk. It is the seat of Carthage College (Lutheran). Pop. (1910) 2,373; (1920) 2,129.

Carthage, city, Missouri, county seat of Jasper county, on the Spring River, and on the Missouri Pacific and the St. Louis and San Francisco Railroads; 56 miles west of Springfield. It is the intersecting point of two primary highways, one connecting with St. Louis, the other with Kansas City. Its most important industry is the mining of lead and zinc. Manufactures include furniture, plows, flour, canned goods, textiles, shoes, beds, ice, brick, and lime. There are also foundries and machine shops. Marble is quarried and small fruits are grown in the vicinity, which is famous, also, for its Jersey cattle.

In the Civil War Carthage was the scene of an indecisive battle, when on July 5, 1861, for several hours, General Sigel, with 1,500 men, held in check 3,500 Confederates under Jackson and Price. Sigel was superior in artillery, but was forced to fall back to cover his baggage train. The killed and wounded numbered about 50 Federals and 150 Confederates. Pop. (1910) 9,483; (1920) 10,068.

Carthage, village, New York, in Jefferson county, on the Black River and on the New York Central Railroad; 16 miles east of Watertown. It has two modern high schools. Industrial establishments include paper and pulp mills, tanneries, furniture and carriage factories, machine shops, foundries, and ice plants. Pop. (1910) 3,563; (1920) 4,320.

Carthage, former village, Ohio, in Hamilton county, on the Baltimore and Ohio, the Cincinnati Northern, and the Erie Railroads; 7 miles northeast of Cincinnati. It has recently been incorporated in the city of Cincinnati.

Carthagena. See CARTAGENA.

Carthago Nova. See CARTAGENA.

Car'thamin ($C_{14}H_{16}O_7$), a coloring matter extracted from the safflower (q. v.) (*Carthamus tinctorius*) by means of alkaline solutions. It is a red powder, soluble in alkaline solutions, and precipitated by acids; it is also soluble in alcohol, giving a rich purple color. Carthamin is used as a component of rouge.

Carthu'sians, ORDER OF, a Roman Catholic monastic order founded in 1086 by St. Bruno, who with six followers retired to the lonely spot known as La Chartreuse, near Grenoble, and there built three small huts and a tiny chapel which later developed into the great monastery of La Grande Chartreuse (see CHARTREUSE). In 1170 the order received recognition by the Pope, and after that spread rapidly through Italy, Spain, and Switzerland. It reached England in 1180, where the name was corrupted to Charter House.

The Carthusians are divided into fathers and lay brothers. Asceticism, fasting, prayer, reading, and manual labor, combined with an almost absolute retirement, and an abstention from speech except when at church or during their weekly walk, are the characteristics of the brotherhood. The Carthusian nuns, dating from the twelfth century, observe similar but somewhat less rigid rules.

In the eighteenth century there were some 170 Carthusian monasteries, the majority of which were in France, and the most magnificent of which were La Grande Chartreuse (France) and Certosa di Pavia (Italy). The Revolution struck the order a heavy blow, the French monasteries were vacated, and most of the monks retired to Spain. At present there are about twenty-five Carthusian monasteries. Consult Bontrais' *The Monastery of the Grand Chartreuse.*

Cartier, kär-tyā', SIR GEORGE ETIENNE (1814–73), Canadian statesman, was born in St. Antoine, Quebec. He was educated at St. Sulpice College, Montreal, was admitted to the bar in 1835, and entered parliament as a Conservative in 1848. He was appointed attorney-general for Lower Canada in 1856, and from 1858 to 1862 was associated with Sir John Macdonald in the Cartier-Macdonald ministry. During this time he carried through the codification of the civil laws and laws of procedure of Lower Canada, a work of the utmost value, took an aggressive part in the building of the Grand Trunk Railway, and was one of the leaders in the movement for Confederation. He was minister of militia and defence (1867–72) in Sir John MacDonald's Cabinet, and in 1872 went to England, where he died the following year.

Cartier, JACQUES (1494–1557), famous French explorer, was born in St. Malo. Having gained a reputation as a fearless navigator, he was chosen to head an expedition to America and in 1534 he reached Newfoundland and penetrated the St. Lawrence as far as Anticosti Island. The following year he sailed up the St. Lawrence to the Indian village of Hochelaga, where later was to be the city of Montreal—a name originally given by Cartier, in the form 'le Mont Royal,' to a neighboring mountain. He also gave the name St. Lawrence to a small bay opposite the island of Anticosti.

In 1541, having been appointed 'captain-general' of a new expedition, Cartier was sent on ahead 'to the lands of Canada and Hochelaga,' which, according to King Francis, 'form the extremity of Asia towards the West.' His object this time was to found a colony, and he established a settlement, which he called Charlesbourg-Royal, on the St. Lawrence, at the mouth of the Cap-Rouge. Roberval, the newly appointed viceroy, failed to arrive, however, and the settlers became so discouraged and homesick, that in the spring of 1542 Cartier took them back to France, refusing to return when ordered to do so by Roberval, whom he met soon after beginning his homeward voyage. For his discoveries and explorations he received a patent of nobility, and after 1542 lived in St. Malo until his death. Cartier's *Voyages* may be found, in French, among the *Historical Documents* published in 1843 by the Quebec Literary and Historical Society, and in English, in Pinkerton's *General Collection of Voyages and Travels.* Consult, also, Parkman's *Pioneers of France in the New World;* Winsor's *Cartier to Frontenac;* Baxter's *Jacques Cartier.*

Car'tilage, the gristle or elastic substance in which bone is formed, and which remains permanently as the covering of the ends of bones in joints. Cartilage is white or bluish white, and semi-transparent. Three varieties are generally described: (1) Hyaline, so called because of its glassy semi-transparency, covers the ends of bones in movable joints, and forms the junction of ribs and breast bone, and parts of the larynx and trachea. (2) Fibrocartilage, with parallel wavy fibres in the groundwork, is that form which is found between the vertebræ. (3) Elastic cartilage, made more elastic than the others by the branched fibres composing its matrix, is found in the ear, and, with hyaline cartilage, in the larynx. All bones are preformed in cartilage, with the exception of some of those of the head.

Cartilaginous Fishes, that subclass of fishes in which the skeleton is cartilaginous and the teeth and scales (with the exception of slight hints in the vertebral column) are the only bony structures. It includes the sharks and rays. See ELASMOBRANCHS.

Cartography. See MAPS AND MAP MAKING.

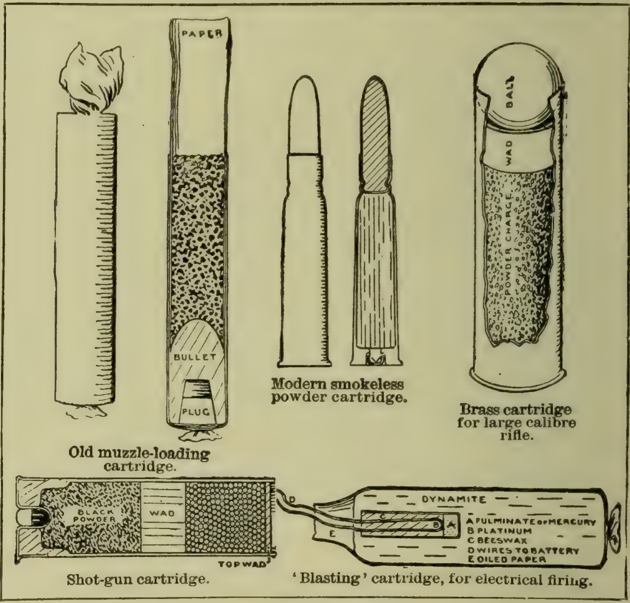
Cartomancy, a form of fortune telling by cards. See DIVINATION.

Carton, R. C. (1853–), English actor and dramatist, whose real name was R. C. Critchett, was born in London. He appeared as an actor in 1875 in *The Sea of Ice,* and after various successful rôles retired from the stage in 1885 to devote himself to writing. He collaborated with Cecil Raleigh in *The Great Pink Pearl* and other plays, and in 1890 produced his first play written alone, *Sunlight and Shadow.* This was followed by his serio-comic *Liberty Hall,* produced at St. James's Theatre by George Alexander, *The Home Secretary, Robin Goodfellow, The Squire of Dames, The Tree of Knowledge, A White Elephant, Lord and Lady Algy, Wheels within Wheels, Lady Huntworth's Experiment, The Ninth Waltz, Public Opinion, Lady Barbarity, The Off Chance, Nurse Benson, The Undercurrent, Mr. Preedy and the Countess, One Too Many,* and others.

Cartoon, kar-to͞on′, originally a full-sized drawing upon strong paper of a design to be carried out in oil paint, fresco, tapestry, stained glass, or mosaic. The design is transferred, by tracing or punching, from the cartoon to the panel or wall, when painting or mosaic is to be used; in tapestry, the main outline of the design is traced on the warp and the tapestry-worker, with the cartoon beside him, imitates it in colored threads. The most widely known cartoons are those prepared (1515–16) by Raphael for tapestries woven at Brussels (not at Arras, as is often erroneously stated) for Pope Leo x. The seven which survive are in the Victoria and Albert Museum, South Kensington. Leonardo da Vinci's *Battle of the Standard* and Michelangelo's *Pisa Cartoon* are equally famous in art history; but they have disappeared, and the designs are only known from engravings. Of recent years the term has been used to denote the semi-satiric drawings, dealing with political or social events, which appear in the humorous papers. In the latter sense it is now also applied to the caricatures which are issued as separate prints. See CARICATURE.

Cartouch, kär-to͞och′, a canvas case in which cartridges are conveyed from the ammunition box to the gun in a field battery, in order to keep them dry. The name signifies also the pouch box carried by soldiers for holding rifle cartridges; but bandoliers in many services have now superseded cartridge boxes.

Cartouche (Fr. 'roll of paper'), kär-to͞osh′, an architectural ornament resembling a roll of paper, usually intended for an inscription or device. The name was given by Champollion to the ovals on monuments and in papyri on which the hieroglyphic characters for the names of Egyptian kings are inscribed. It also signifies the modillions or ornamental blocks supporting the eaves of a house.



Old muzzle-loading cartridge.
Modern smokeless powder cartridge.
Brass cartridge for large calibre rifle.
Shot-gun cartridge.
'Blasting' cartridge, for electrical firing.

Types of Cartridges

Cartridge, a military term signifying, in its present use, one complete round of ammunition for a small arm (rifle, pistol, carbine, shotgun, etc.). The first cartridges were made for muzzle-loading guns, and consisted of the powder and the ball or shot tied together in one bundle. The soldier tore off the paper from the powder end of this cartridge, poured the powder into the barrel, rammed home the ball and paper surrounding it, often by striking the butt of his musket on the ground, put on a percussion cap and fired.

Modern cartridges for military use consist of a brass case, an oblong lubricated bullet of lead and tin composition with a cupro-nickel jacket, a primer of mercury fulminate, and a charge of smokeless powder. Such a cartridge is called a *ball cartridge*, in contradistinction to one similar in all respects, but having a bullet of paper which is called a *blank cartridge*. There are also *dummy cartridges* containing no powder or primer, and a *multiball cartridge*, containing two or more round balls used for short ranges only and never in actual war.

Gallery practice cartridges contain a round ball and reduced charge of powder. The brass case acts as a gas check and is a necessity in breech-loading rifles and carbines. The revolver cartridge is similar to that for the rifle, only shorter. Sporting cartridges for shotguns consist of a strong paper case with brass base, and shot of various sizes instead of a bullet; those for rifles are similar to the military cartridge. All modern cartridges are central fire, that is, have the primer in the centre of the base, instead of rim fire, in which the hammer struck the rim and cut into the primer; or, pin fire, in which a flat hammer fell on a radial pin which exploded the primer. See Ammunition; Artillery; Guns; Projectiles; Rifle.

Cart'wright, Edmund (1743–1823), English inventor, was born in Marnham in Nottinghamshire and became rector of a church in Leicestershire (1779), where he made agricultural experiments on his glebe land. After visiting the cotton-spinning mills of Sir Richard Arkwright, he invented the power loom (1784), and between 1789 and 1793 took out four patents for a wool-combing machine, for which he received a grant of £10,000 from the British government.

Cartwright, John (1740–1824), English political reformer, elder brother of Edmund Cartwright (q. v.), was born in Marnham, in Nottinghamshire. At eighteen he entered the British navy, saw some service under Lord Howe, and in 1766 was gazetted first lieutenant of the *Guernsey* on the Newfoundland station. His sympathies were with the American colonies during the Revolutionary War, and he declined to fight with Lord Howe's command in America. He wrote on political subjects—the ballot, universal suffrage, etc. —but was fined £100 for sedition (1820). In 1774 he published *American Independence, the Glory and Interest of Great Britain*, and in 1775 he wrote *A Letter to Edmund Burke, controverting the Principles of American Government laid down in his lately published speech on American Taxation.*

Cartwright, Peter (1785–1872), American Methodist clergyman, known as the 'backwoods preacher,' was born in Amherst county, Va. He was converted at a camp-meeting in 1801, and after 1802 was an itinerant Methodist preacher, chiefly in Kentucky, Ohio and Tennessee. He returned to Illinois in 1824, served for two terms in the Illinois legislature, and in 1846 ran, unsuccessfully, for election to Congress against Abraham Lincoln. Rugged, tireless, enthusiastic, an effective speaker, he did much to build up the Methodist Church in the Middle West, and was a representative pioneer preacher. His *Autobiography* is of great interest. Consult also Stevens' *The Backwoods Preacher.*

Cartwright, Sir Richard John (1835–1912), Canadian statesman, was born in Kingston, Ontario, and received his education at Trinity College, Dublin. He entered the Canadian Parliament as a Conservative in 1863, but, dissatisfied with the financial policy of his party, went over to the Liberal side in 1873. He was minister of finance under Mackenzie (1873–8), and thereafter was a leader in the Liberal party. In 1896 he became first Minister of Trade and Commerce in Sir Wilfrid Laurier's cabinet. He was acting Premier in 1897, and again in 1907. He proposed and was a member of the Anglo-American Joint High Commission that met in Quebec in 1898, was made a member of the Imperial Privy Council, and was appointed to the Senate in 1904. He was knighted in 1879. Consult his *Reminiscences* (1912).

Cartwright, Thomas (1535–1603), English Puritan divine, was born in Hertfordshire. He became (1569) Lady Margaret divinity professor at Cambridge, but was later (1570) deprived of office. He engaged in a controversy with John Whitgift (q. v.) and was several times imprisoned for nonconformity.

Cartwright, William (1611–43), English divine, poet, and dramatist, was born in Northway, Gloucestershire. He became reader in metaphysics at Oxford (1635), took orders, and was famed for his plays, and for his florid and eloquent sermons. An ardent royalist, he was appointed on the council of war (1642), and fell a prisoner into the hands of Lord Say. His collected works, *Comedies, Tragi-Comedies, with Other Poems* were issued in London in 1651.

Carucate, kar'ū-kāt, or Carrucate, a term of mediæval origin denoting a 'plough-land' or 'plough-gate'—*i.e.* as much land as could be tilled in one year by a single plough drawn by eight oxen.

Carucci, Jacopo. See Pontormo.

Carúpano, kä-rōō'pä-nō, seaport, Bermudez, Venezuela, 150 miles west of the island of Trinidad, between the Araya and Paria peninsulas. It is a commercial centre and exports coffee, cocoa, sugar, brandy and pottery. Lead ore exists in the neighborhood. Pop. 12,000.

Carus, kā'rus, Julius Viktor (1823–1903), German zoölogist, was born in Leipzig. He was custodian of the museum of comparative anatomy at Oxford (1849–51), professor of comparative anatomy and professor extraordinary of zoology at Leipzig, and lecturer at Edinburgh University (1873–4). His many estimable books include *Prodromus Faunæ Mediterraneæ* (1884–93), *System der Thierischen Morphologie* (1853), and a translation of Darwin's works. He edited the *Zoologischer Anzeiger* from its foundation (1878).

Carus, Karl Gustav (1789–1869), German physiologist and physician, was born in Leipzig. He studied medicine, became professor of obstetrics at Dresden (1814), was appointed court physician (1827), and was elected president of the Imperial Academy (1862). Among his numerous works on anatomy and physiology may be mentioned *Gründzuge der vergleichenden Anatomie* (1828), and *System der Physiologie* (1838–40). To his friendship with Goethe we owe *Goethe* (1843) and *Goethe und seine Bedeutung für diese und künftige Zeit* (1863). He published also *Lebenserinnerungen und Denkwürdigkeiten* (4 vols. (1865–6).

Carus, Marcus Aurelius, emperor of Rome (282–283 a.d.), was præfect of the prætorian guards under Probus, and when that emperor was murdered by the army in 282, became his successor by the choice both of troops and senate. After repelling a Sarmatian invasion into Illyricum, he marched against the Persians, and overran Mesopotamia, capturing Selucia and Ctesiphon. When he was about to extend his march beyond the Tigris, he died suddenly, whether from disease, treachery, or lightning is not known.

Carus, Paul (1852–1919), American author, was born in Ilsenburg, Germany, and was graduated (1876) from the University of Tübingen. Having established himself in Chicago, he became editor of the *Open Court* and the *Monist.* His works include *The Soul of Man* (1891); *Primer of Philosophy* (1893); *Monism: Its Scope and Import* (1891–2); *Religion and Science* (1893); *The History of the Devil* (1900); *The Surd of Metaphysics* (1903); *The Age of Christ; God, an Enquiry into Man's Highest Ideals; Nietzsche and Other Exponents of Individualism; The Principle of Relativity from the Standpoint of the Philosophy of Science;* and a number of books on Chinese religion and philosophy.

Caruso, kȧ-rōō′zō, Enrico (1873–1921), Italian operatic tenor, was born in Naples, and at the age of fifteen decided to devote himself to music. He studied with Vergine, Lamperti and Concone, made his *début* at Naples in 1894, and scored his first great success as Alfredo in *Traviata* in the same city in 1896. He appeared in Milan in 1898, and thereafter sang in St. Petersburg, Moscow, Warsaw, Rome, Paris, London, and Germany. His American *début* was made in 1903, in *Rigoletto,* at the Metropolitan Opera House, where he continued to sing until stricken by the illness that resulted in his death. Caruso had a voice of extraordinary power and beauty and was generally considered the greatest operatic tenor of his day. His repertoire included *Aïda, Rigoletto, La Bohème, La Favorita, La Traviata, Madame Butterfly, Cavalleria Rusticana, Faust, Carmen, Lucrezia Borgia, Le Prophète, Manon Lescaut, Il Trovatore, Samson et Delilah, Don Giovanni,* and others. He died in Naples on Aug. 2, 1921, and at the order of King Victor Emmanuel was buried with special obsequies from the royal basilica of San Francesco di Paola in Naples.

Caruthersville, *ka*-rōōth′*erz*-vil, city, Missouri, county seat of Pemiscot county, on the Mississippi River and the St. Louis and San Francisco Railroad; 220 miles southeast of St. Louis. It has manufactures of ice, cotton, cottonseed oil, and lumber. Pop. (1910) 3,655; (1920) 4,750.

Carvel, kär′vel, or Caravel a light, short, masted ship with a square poop, formerly used in Spain and Portugal; also a small vessel once used by the French for herring fishing. In a carvel-built craft the edges of the planks meet, but do not overlap.

Car′ver, John (*c.* 1575–1621), leader of the Pilgrim Fathers, was born in England, took refuge, with others in Holland in 1607–8 and became agent for the expedition to New England. He left in the *Mayflower* on Sept. 6, 1620, and arrived in Massachusetts, where the town of New Plymouth was built. He was the first governor of Plymouth Colony (1620–21), and was reelected in March, 1621, but died of sunstroke in April.

Carver, Jonathan (?–1780), American traveller, was born in Conn. He served in the French and Indian War, and after its close travelled extensively (1766–8) in the then almost unknown Northwest, acquired by England from France by the treaty of Paris (1763), reaching the Mississippi by way of the Fox and Wisconsin rivers. In 1769 he went to England, and in 1778 there appeared in London, under his name, a book entitled *Travels through the Interior Parts of North America.* This book was exceedingly popular and became recognized as one of the best accounts ever published of the characteristics and customs of the Indians; but according to the recent investigations of E. G. Bourne, much of the book (which, it seems probably was not written by Carver, though his notes were doubtless used) is merely a paraphrase of previous accounts of the Indians and of travels among them.

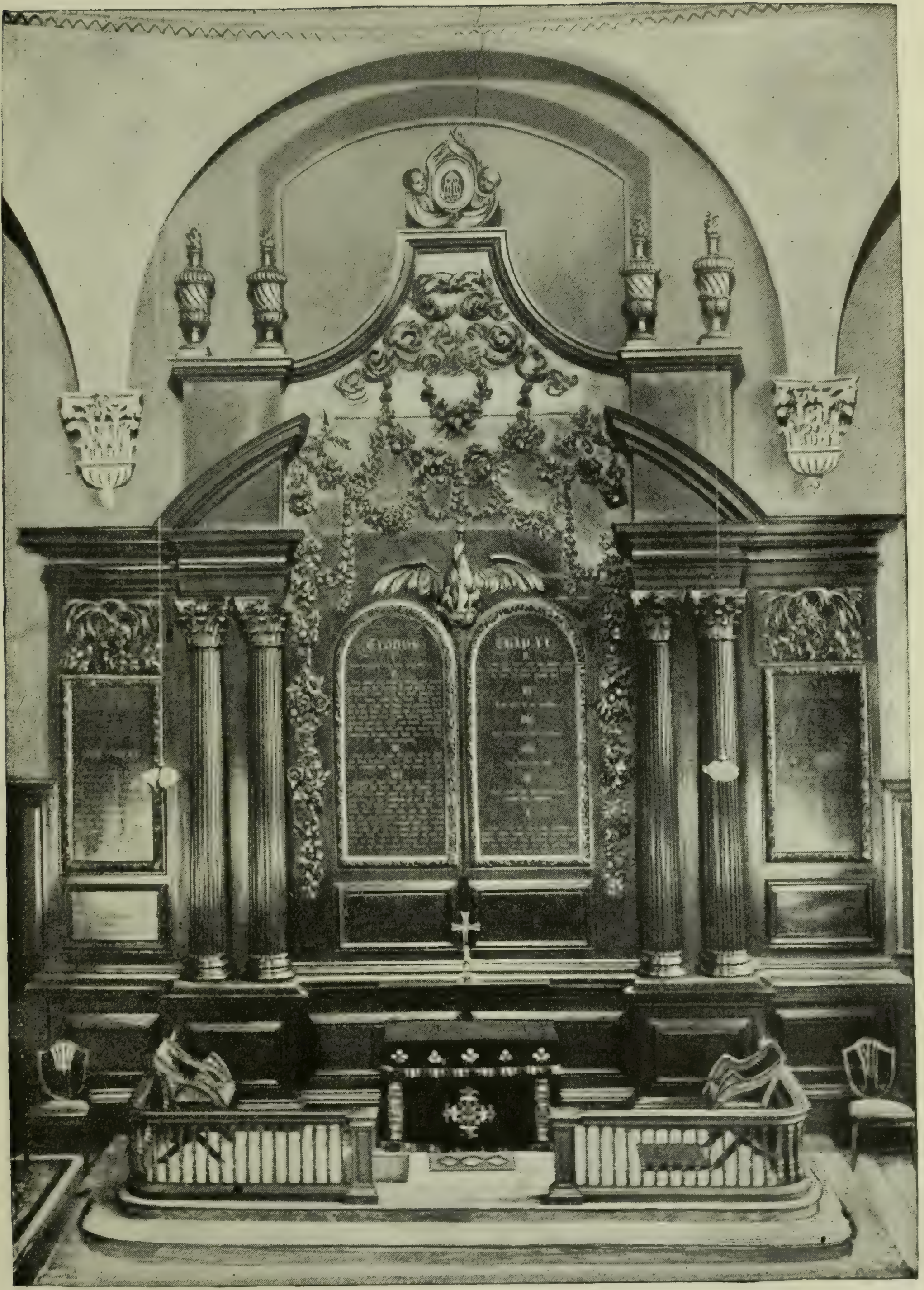
Carving is the art or act of cutting ornamental or naturalistic forms in stone or marble, ivory or wood. As a rule, work in stone or marble, whether in the form of separate figures or groups or of important figure-reliefs, is called sculpture; the less important carved ornament on buildings is described as architectural carving or sculpture, and the word carving is applied in a special sense to work in ivory and its substitutes and in wood.

Carving, in this restricted sense, is one of the oldest of the arts, and among half-civilized or savage peoples it is usually found in greater perfection than flat-colored decoration. The carved or incised bones found in prehistoric caves in France are perhaps the oldest art objects known and in Egypt and Nineveh carved work in ivory dates from early times. In Greece ivory was used for many ornamental purposes, and a number of famous statues, such as the colossal figures of Athene at Athens and Jupiter at Olympia, were executed in ivory and gold. From late Roman times there is an almost unbroken series of examples of ivory carving. Under Byzantine influence Eastern forms of surface decoration became evident, and figure work, almost entirely religious in motive, became stiff and formal. The mediæval period, which followed, has left many fine pieces, and of these several of the most beautiful and spirited are French. The ecclesiastical work (shrines, altar-pieces, crosiers, book covers, statuettes) is full of the spirit of the Gothic church builders; the domestic (mirror cases, combs, caskets, horns), of the chivalry of the age; in both colors and gold were freely used.

The Early Renaissance produced numerous fine ivory carvings of a similar kind, but more delicate in treatment, more complete in form, and showing classical influences. Many connoisseurs consider the work of the sixteenth century the best extant, but refined invention gradually died out, imitation gained the ascendant, and cleverness is almost the sole merit of many elaborate pieces of the seventeenth and eighteenth centuries. Ivory is also a favorite material in India, China, and Japan; but while Eastern carvers show great skill and possess a sense of the grotesque, their figure work is usually debased. (See Ivory, particularly illustration of Carved Ivory there given.)

Wood carving is probably of even greater antiquity than ivory carving, the wooden sculpture of Egypt being the earliest that survives; but, although wood carving was practised in Greece and Rome it is not until the mediæval period that authentic examples are again available. These, of course, partake of the architectural styles of the periods to which they belong. In churches, particularly in the north of Europe, statuettes, shrines, and elaborate altar-pieces, carved in wood, gilded and colored, were common, and stall-work and screens were often both elaborate and fine. In the same countries the fronts of the timbered houses presented a great field for the carver, and inside roofs and panellings were often carved. In Italy and in France, where Italian influences were strong, carved furniture was also in fashion. During the late seventeenth century Grinling Gibbons (q. v.) a Dutchman, introduced into England a style of wood carving which had great and persistent influence there. (See Furniture.) Consult Alfred Maskell's *Ivories* and *Wood Sculpture.*

Ca′ry, Alice (1820–71) and Phoebe (1824–71), American poets, sisters, were born in the Miami Valley, near Cincinnati, and educated themselves at home. Alice began to write poems



REREDOS OF ST. MARY ABCHURCH, LONDON.

(Reputed to be the finest example of the carving of Grinling Gibbons.)

and sketches for the press at the age of eighteen years, and these were followed by a volume of *Poems by Alice and Phoebe Cary* (1850). The sisters removed to New York in 1850 and lived thereafter principally in that city. Their New York residence was the scene of weekly receptions, attended by literary and artistic people, for many years. Alice's writings are characterized by grace and sweetness, and include *The Clovernook Papers* (1851–3), *Lyra, and Other Poems* (1853) *Ballads, Lyrics, and Hymns* (1866), and several works of fiction. Phoebe's was a minor note; she published *Poems and Parodies* (1854), *Poems of Faith, Hope, and Love* (1868), and contributed a number of hymns to collections of the day, the best known being that entitled 'Nearer Home.' See Mary Clemmer Ames's *Memorial of Alice and Phoebe Cary* (1873).

Cary, Annie Louise (1842), American singer, was born at Wayne, Me., graduated at the Gorham, Me., Female Academy, and studied under Lyman W. Wheeler at Boston, Mass., and under Giovanni Corsi at Milan. Before leaving for the latter city, where she passed three years, Miss Cary's magnificent contralto voice had been heard in concerts in this country. On the completion of her musical education she made her début in Italian Opera at Copenhagen, and sang for several years in various cities of Northern Europe. Returning to the U. S., she joined the Italian Opera Company at the New York Academy of Music, with which she remained for six years, having as fellow-members some of the leading singers of the time, and achieving the greatest artistic triumphs of her career. Miss Cary revisited Russia in 1875–7, and on her return resumed her American appearances, retiring to private life on her marriage, 1882, to Charles Monson Raymond, a New York banker.

Cary, Archibald (*c.*1730–86), American patriot, was born in Virginia, and served in the Virginia House of Burgesses. He joined the earliest movement against British oppression, was a member of the committee of correspondence (1773) and of the Virginia Convention of 1776, and as chairman of the committee of the whole reported the resolutions instructing the Virginia Delegates in Congress to propose independence. He was President of the Virginia Senate from the organization of the state government until his death.

Cary, Henry Francis (1772–1844), translator of Dante, born at Gibraltar; published his translation of the *Inferno* (1805), followed by the whole of the *Divina Commedia* (1814), which still holds a foremost rank. See *Memoir* by his son (2 vols. 1847).

Caryatides (Gr. *Caryalis*), an architectural term signifying those draped female figures, in Hellenic buildings usually of the Ionic style, which supply the place of pillars. One of the finest examples of the use of caryatides occurs in the Erechtheum in Athens. Michael Angelo also employed them.

Caryatid, from the Erechtheum, Athens.

Caryocar. A genus of trees, natives of tropical America. They are celebrated for the kernels of their drupes, which are embedded in a mealy pulp, and consist of a delicious white, oily jelly-like mass, covered by a membrane. An oil is extracted from them which is almost as good as that of olives, and they are called souari- or butter-nuts. *C. Nuciferum* is cultivated in the W. Indies. The timber of caryocar is used for house and boat building.

Caryophyllaceæ, an order of flowering plants characterized by the pistil being syncarpous, the leaves entire and opposite, placenta free central, the stem swollen at the nodes, calyx and corolla each of five parts. Among the chief genra may be named Cerastium, Stellaria, Dianthus, Lychnis, Silene, and Saponaria.

Caryota, a genus of spineless palms with bipinnate leaves, the genus which is sometimes known as the fish-tail palms, from the triangular shape of the leaflets which are attached at their apices. When fully grown the plants bear large green or purple flowers, the spadices hanging down in graceful bundles. The caryotas are easily grown in a warm green-house, being propagated by seeds or by suckers. Among the species may be named the wine-palm, *C. urens*, which reaches a height of over forty ft. It is found in India and in the E. Indies and has fruit so acrid that the pulp stings flesh that it touches. During the hot season, much sugar (*Jaggery*) and wine or 'toddy,' are made by boiling down or fermenting the copious juice which escapes from wounded flower-spathos; thus the names of 'jaggery'- or 'toddy'-palm. A starchy food is obtained from the trunk. A fibre with brownish-black filaments, which often resemble horsehair, and which can be curled over a finger nail, is of importance, and is taken from the leaves. It is made into cordage, baskets and brushes, and has been used, with horsehair, for stuffing cushions.

Casa, Giovanni della (1503–56), Italian writer, born in the Mugello valley, near Florence. Pope Paul III. made him archbishop of Benevento and nuncio at Venice (1544), where he distinguished himself as a violent opponent of the Protestants. Later Paul IV. appointed him Secretary of State, a post he held till his death. His fame rests chiefly on the little book, *Il Galateo, ovvero de' Costumi* (written between 1551–5; Eng. trans. 1576; new ed. 1892), which presents an admirable picture of the court manners of the Italian renaissance. See Forcellini's edition of the *Opere* in 3 vols. (1952); a selection appeared at Milan in 1879. A Life by Casotti was prefixed to the Florentine edition of 1707.

Casaba, or Kassaba, tn., vilayet Smyrna, Asia Minor, on railway to Alashehr, 54 m. S.S.E. of Konieh; is famous for its pears and melons, and exports cotton and raw silk. Pop. 23,000.

Casabianca, Louis de (1755–98), French naval officer, born in Corsica. He took part with the Comte de Grasse in the American Revolutionary War; was mortally wounded at Aboukir (the battle of the Nile), and perished with his burning ship, his little son declining to desert him. See the poem by Mrs. Hemans.

Casablanca, or Dar-el-Beida, walled seapt. tn., W. coast of Morocco (q.v.), 15 m. N.E. of Mazagan. During the native uprising of 1907 the town was bombarded (Aug. 6) by French vessels, and looted by Arabs, who killed many people.

Casa Grande, vil., Pinal co., Ariz., on the Tucson div. of the S. Pac. R. R. Fifteen m. E. by S. is the famous ruin constructed by a prehistoric race.

Casale, or Casale Monferrato, fort. tn. and episc. see, prov. Alessandria, Italy, 21 m.

by rail N.W. of Alessandria, on the r. bk. of the Po. The cathedral dates from the 8th and 12th centuries. There are some other interesting churches (San Domenico, begun in 1489) and private palaces (one with frescoes by Giulio Romano). Pop. (1901) 31,790.

Casamance, riv., W. Africa, in the French colony of Senegal; forms a wide estuary which enters the ocean in about 12° 30′.

Casanova. **(1.)** GIOVANNI GIACOMO DE SEINGALT (1725–98), Venetian adventurer, remarkable for his wit, accomplishments, and intrigues. He travelled from capital to capital in Europe, frequenting the most aristocratic society, and leading a generally rakish life. Besides a translation into verse of the *Iliad,* he wrote *Memoirs* (12 vols. Leipzig, 1828–38), which are vastly entertaining as a picture of the corrupt manners of his time. **(2.)** GIOVANNI BATTISTA (1722–95), his brother, was a painter, and became professor in the Academy of the Fine Arts, Dresden. He wrote *Monumenti Antichi.* **(3.)** FRANCESCO (1730–1805), another brother, born in London, was also a painter, who obtained a high reputation in Paris for battle-pieces and landscapes, and also in Vienna, where the Empress Catherine II. of Russia employed him to illustrate her victories over the Turks. His pictures exist in Rouen, Nancy, Lyons, and other French towns; and his *Ferry Boat* hangs at Dulwich College, London.

Casas Grandes, tn., Chihuahua state, Mexico, 160 m. N.W. of Chihuahua, and connected by rail with El Paso, New Mexico. Primitive ruins are numerous in the locality. It was discovered by the Spaniards in 1660.

Casati, GAETANO (1838–1902), Italian explorer, born at Lesmo, near Monza. At the request of the Commercial Geographical Society of Milan he undertook a journey to the Sudan, during which he explored the region of the river Welle-Makua, and (1881) met the German traveller Junker. In 1883 he arrived at Lado, where he joined Emin Pasha. In 1888 he had a narrow escape, being condemned to death by Kabba Rega, king of Unyoro, to whom he was sent on a mission by Emin Pasha. In 1889 he returned to Italy, and published *Dieci Anni in Equatoria e ritorno con Emin Pascha* (1891).

Casaubon, ISAAC (1559–1614), Swiss classical scholar, born at Geneva, became professor of Greek there (1582) and at Montpellier (1596). He next became royal librarian at Paris; but on the death of Henry IV., who protected him, his pronounced Protestantism made it advisable for him to leave Paris. Settling in London in 1611, he wrote a confutation of Cardinal Baronius, which laid him open to the charge of having been hired by James I. Casaubon, whose zeal in the accumulation of knowledge was ceaseless, belonged to the class of humanists who devoted themselves to wide and catholic research. He was appointed prebendary of Canterbury and Westminster, and was buried in Westminster Abbey. Besides publishing editions of Athenæus (1600), Aristotle (1590), Polybius (1609), Strabo (1587), Persius (1605), and other classical writers, Casaubon was the author of the following works: *De Satirica Græcorum Poesi et Romanorum Satira* (1605), *De Libertate Ecclesiastica* (1607), and *Exercitationes contra Baronium* (1614).—Casaubon's son, MÉRIC CASAUBON (1599–1671), was also a distinguished scholar, appointed professor of theology at Oxford. He published a defence of his father, wrote several Latin works, and edited Terence, Marcus Aurelius, Epictetus, etc. See *Casauboniana* (1710); Casaubon's *Ephemerides,* ed. by J. Russell (1850); *Isaac Casaubon,* by Mark Pattison (1875; 2d ed. 1892); and Nazelle's *I. Casaubon, sa Vie et son Temps* (1897).

Casca, PUBLIUS SERVILIUS, tribune of the plebs at Rome in 44 B.C., and one of the murderers of Cæsar. He fell in the battle of Philippi (42 B.C.).

Cascade, mountain range in N.W. of the United States, traversing, with a N. and S. trend, the states of Washington, Oregon, and N. California. It precipitates the moisture from the W. winds, and on that side is bordered by fertile lands and well-timbered slopes; whereas, the region to the E. is arid or desert. Except in N. Washington, where it is composed chiefly of granites, it is a volcanic range, covered by successive flows of lava. With a general summit elevation of from 6,000 to 7,000 ft., rising to 8,000 ft. or more in N. Washington, the range bears on its crest or flanks many extinct volcanoes, such as Shasta, in Cal. (14,380 ft.); Jefferson (10,350 ft.), and Hood (11,225 ft.), in Ore.; and Adams (12,470 ft.), St. Helens (10,000 ft.), Rainier or Tacoma (14,363 ft.), Glacier Peak (10,436), and Baker (10,827 ft.), in Wash.

Cascara Bark, or CASCARA SAGRADA, or CHITTEM-BARK, is obtained from a small tree (*Rhamnus Purshiana*) which belongs to the natural order Rhamnaceæ, and grows abundantly in the western United States. It is collected in spring and early summer, when it is easily peeled from the wood, and when dried curls into quills. The fluid extract is prepared from the dried bark and is used in medicine as an aperient and tonic. It is believed to act chiefly on the muscular coats of the intestine.

Cascarilla Bark is obtained from the twigs and branches of *Croton Eleuteria,* a small tree of the Euphorbiaceæ, found in the Bahama Is. Its outer layer is a grayish-white cork, with a checkered appearance. The bark has a pleasant, aromatic odor, and an aromatic but disagreeably bitter taste; when burned, it gives an agreeable scent, and is therefore used in incense. It is also a tonic and febrifuge. The name 'cascarilla' is given to various commercial, bitter, medicinal barks, in S. America.

Cascina, comm., prov. Pisa, Tuscany, Italy, on riv. Arno, 7½ m. S.E. of Pisa; engaged in cotton-weaving. Battle fought here in 1364, between the mercenaries of Pisa and Florence, when the latter, under Galeotto Malatesta, defeated their opponents. Pop. (1901) 25,895.

Casco Bay, a bay on the coast of Cumberland co., Me. It extends from Cape Elizabeth to Bald Head, near the mouth of the Kennebec R., a distance of 20 m. across its mouth. The islands of the bay, said to number 365, are nearly all utilized as summer resorts. Portland is at its W. end.

Case, the grammatical term for the various inflectional forms of the substantive parts of speech. Modern English has two cases in the noun—*viz.* the nominative, or normal form of the substantive, and the genitive or possessive, expressing origin: '*men's* sons.' In the pronoun we have, in addition, the dative, expressing the direction of an action—'I gave it *him';* and the accusative, denoting the object of the action—'I saw *him.*' Other Indo-European languages possess a vocative case, used in direct address; an ablative, answering to our prepositions 'with' or 'from'; an instrumental, 'by means of'; and a locative, 'in' or 'at.'

Case. See TRIAL, PRINTING.

Caseation (Lat. *caseus,* 'cheese') is an advanced stage of degeneration in animal tissues, in which they become of a cheesy consistency. It is particularly associated with tubercular conditions. See TUBERCLE.

Case-hardening, the operation by which wrought iron is hardened by converting the surface into steel. Tools, keys, fire-irons, parts of machinery, etc., to be hardened are packed into an iron box with charcoal, derived from horn, leather, etc., and heated to dull redness for varying periods, according to the size of the article and the thickness of coating required. The carbon enters into combination with the iron, and produces a superficial layer of steel, by much the same action as that by which steel is obtained in the cementation process. Potassium ferrocyanide is often sprinkled on the red-hot iron to supply the carbon. Various modifications of this principle are in use, notably the Harveyizing of steel armor plates, which consist, for the most part, of a tough, malleable steel, but are coated externally with an intensely hard surface.

Caseine, a proteid which is formed in milk, and is the principal constituent of cheese. Under the influence of rennet or acids it separates, and produces curd or caseine. The caseine precipitated by acid differs in several important respects from that precipitated by rennet; for the latter is coagulated, contains phosphates, and is a valuable and concentrated food product. In the milk this proteid is combined with the phosphate of lime; on the addition of acid, the alkaline phosphate is converted into an acid phosphate, and the caseine becomes insoluble. See CHEESE.

Casemate, in modern military engineering, a bomb, or shell proof chamber, usually erected upon or under the parapet of a fortification, and used as a shelter for guns, barracks, magazines, and hospitals. Casemates are constructed of masonry or concrete, the vaulted roof being covered with earth of a thickness sufficient to resist the penetrative power of an exploding shell.

Casentino, picturesque valley of the upper Arno, in the province of Arezzo, Italy. It was celebrated by Dante, and is now a much-frequented tourist resort.

Caserta. (1.) Province of Italy, called Terra di Lavoro down to 1871, and forming part of Campania; stretches from the S. Apennines (7,250 ft.) s.w. to the Tyrrhenian Sea. In spite of its mountainous character it is very fertile, and yields wheat, forage crops, wine, olives, fruits, timber, marble, and fish. Area, 2,033 sq. m. Pop. (1901) 785,357. (2.) Town and episc. see of Italy, cap. of above prov., 17 m. N.E. of Naples; has grown up around the royal castle, built here in 1752 by Charles III. of Naples. Large silk works in vicinity. Pop. (1901) 32,709.

Case School of Applied Science. A scientific school in Cleveland, O., founded in 1881 on an endowment given by Leonard Case. The institution has had rapid development and ranks among the important technological schools of the country. It is organized in departments of mathematics and astronomy, English, economics, modern languages, geology and mineralogy, drawing and applied mechanics. The last forms the foundation of the special work done in the department of civil, mechanical, electrical, and mining engineering, physics and chemistry, and is required of all students. A course in general sciences is provided for students who desire a scientific education with specializing in any single department. The students in 1905 numbered 400 and the faculty 28. The library contained 5,000 volumes.

Case-shot, or CANISTER, a form of projectile formerly much used in gunnery. It consists of a quantity of small shot, etc., enclosed in a metal case or canister, which bursts on being discharged. Case-shot, owing to its small effective range, is now practically superseded by the use of that of machine guns. See AMMUNITION.

Case System. A method of teaching law introduced into Harvard University in 1869 by Professor C. C. Langdell, by which the student is referred directly to the cases which form the law upon the subject of study. This method is now in use in Columbia University, New York University, and other law schools throughout the United States and has received favorable comment abroad.

Casey, THOMAS LINCOLN (1831–96), American soldier and civil engineer, was born at Sackett's Harbor, N. Y., and graduated (1852) at West Point, where he became assistant professor of engineering two years later, serving until 1859. He made a notable record as an engineer officer during the Civil War, and in 1877 was given charge of the public buildings and grounds in the District of Columbia. Among other works he completed the State, War, and Navy Building, the Washington Monument, and the Potomac Aqueduct. In 1888 he was appointed brigadier-general and chief of engineers in the U. S. army, and the following year was given charge of the construction of the new building for the Library of Congress, which was practically finished at the time of his death.

Cash, that which was usually contained in the strong-box—money. In modern commercial language, cash includes not only specie or coin, but bank notes and even checks—in fact, all money or money payable on demand, in contradistinction from bills or other securities.

CASH NOTE. An old name for a 'goldsmith's note' (see BANK); its modern equivalent is a check.

CASH ON DELIVERY SYSTEM. Method in vogue in India, Egypt, New South Wales, Austria-Hungary, Belgium, France, Germany, Holland, Italy, Japan, and Switzerland, whereby postal authorities, railway companies, and other carriers not only deliver goods to a purchaser, but collect the sale price and transmit it to the vendor. The system has been strikingly successful in India and Germany.

Cashel, a city in Co. Tipperary, Ireland. Ruins of the cathedral, founded in the 12th century, with remains of an abbey, palace, and round tower, form a conspicuous group on the summit of a bold limestone mass. The parish church of St. John now serves as the cathedral. The famous 'Synod of Cashel' was held here in 1172. Pop. (1901) 2,938.

Cashew Nut. The fruit of a tree (*Anacardium occidentale*), native to tropical America, that, in the United States, can be cultivated only in southernmost Florida, since it is very sensitive to cold. Its leaves are oval, and it bears panicles of starry, fragrant pink flowers. The peduncle of the fruit becomes greatly enlarged, fleshy, and pear-shaped. It is red or yellow in color, is known as 'cashew apple,' and forms an important article of food, being pleasantly acid; it is also the source of a liquor. At its tip is the kidney-shaped nut, whose kernel is protected by a double shell, and is edible when roasted. A milky juice, which is very acrid, and turns black when exposed to the air, is obtained from the tree, and is useful for varnishing, especially as a protection against ants. A gum, moreover, exudes from the tree.

Cashgar. See KASHGAR.

Cashibos, a tribe of South American Indians on the Ucayali River, who eat the infirm and aged of their own people, and generally live in scattered groups in the woodlands. They are a fine race, of very light complexion. See Brinton's *The American Race*, 1901.

Cashmere. See KASHMIR.

Cashmere or **Shawl Goat,** a breed of the domesticated goat (*Capra hircus*), remarkable for the thick undercoat of wool which occurs beneath the long hair. It is a rather small variety, with pendent ears and long, flattened horns, which are curved outwards and backwards, and have a sharp edge in front. It is most abundant in Tibet, but is also bred by the Kirghiz in Central Asia. There is considerable variation in color, the animals being sometimes of a uniform white tint, and at others dark brown or even black. The undercoat is combed out in summer, and is used in the manufacture both of shawls and of a very fine and soft cloth. Attempts have been made to acclimatize the Cashmere goat in various countries of Europe, but they have met with little success.

Casiguran, pueb., Sorsogon prov., Luzon, Philippines, 7 m. S. of Sorsogon, on Sorsogon Bay. The sea at this point has been encroaching on the coast for a long period at the rate of 3½ ft. per year. Pop. (1903) 7,873.

Casilda, seapt., Santa Clara prov., Cuba, 3 m. S. of Trinidad. Though not deep the harbor is capacious. Pop. (1899) 2,234.

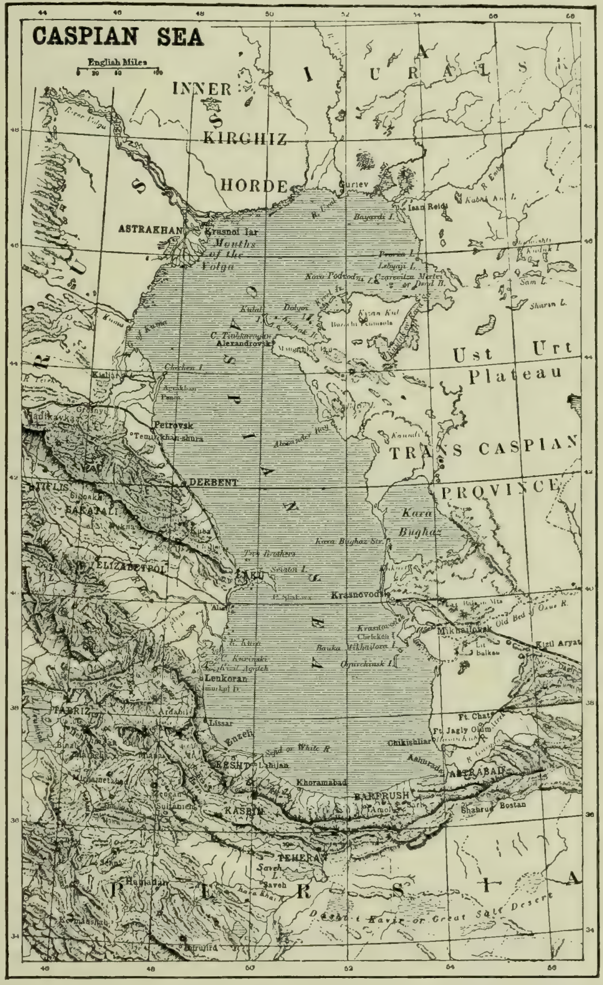
Casimir-Périer, JEAN PAUL PIERRE (1847–1907), ex-president of the French republic, was born at Paris. On the formation of a republican cabinet in 1877, he was appointed under-secretary of public instruction, and retained the post until the Dufaure cabinet went out of office (1879). He retired from the Chamber (February, 1883), when the law was passed excluding members of French royal families from public employment—conduct which, though in accordance with family tradition, caused him to be suspected of leanings towards the Orleanists. Re-entering Parliament, he was appointed under-secretary for the war department (October, 1883), but retired with his chief, General Camperan (January, 1885). Owing to his personal influence with the Republican majority, he was elected (1890) vice-president of the Chamber, and in 1893 president. From December, 1893, to May, 1894, he was prime minister and minister for foreign affairs. On the assassination of President Carnot, in June, 1894, Casimir-Périer, at the time president of the Chamber, was elected president of the republic, but resigned on June 15, 1895.

Casino, an establishment very popular in country places or summer resorts for the promotion of social intercourse. The building, generally one of the most handsome and important in watering-places and other holiday resorts, usually contains conversation, dancing, music, reading, billiard, and other rooms.

Cask. See COOPERAGE.

Caskets, or CASQUETS, dangerous group of islands in English Channel, 8 m. W. of Alderney; the scene of the wreck of the *White Ship* (1120), and of that of the *Victory* in 1744. Victor Hugo has immortalized them in his *Toilers of the Sea* (trans. 1886).

Caslon, WILLIAM (1692–1766), the first great typefounder that England produced, was born at Cradley, Worcestershire. Aided by Bowyer and other printers, he set up in business in a small way in St. Luke's, London. For many years few books of any importance were printed with the types of any other foundry. Caslon took as his model the types of the Elzevir family. The earliest dated specimen of his printing types in book form is in the library of the American Antiquarian Society at Worcester, Mass. It is called *A Specimen of Printing Types, by William Caslon and Son* (1763).



Casoria, tn., prov. Naples, Italy, 6 m. N.E. of Naples. Pop. (1901) 12,725.

Caspari, CARL PAUL (1814–92), German scholar and theologian, born at Dessau, and appointed, in 1857, professor of theology at Christiania—a chair he held till his death. Besides theological and philological studies, including an Arabic grammar (5th ed. 1887), he published *Kirchenhistorische Anekdota* (1883), and *Quellen zur Geschichte des Taufsymbols und der Glaubensregel* (4 vols. 1866–75).

Caspe, tn., Spain, 48 m. from Saragossa; one of the most ancient cities in Spain. Well-known sulphur baths of Fonte in neighborhood. Pop. (1901) 7,735.

Caspian Sea, the largest inland sheet of water on the earth, lies on the border-line between the W. of Asia and the E. of Europe (Russia), with Persia at its S. extremity. Its longest axis stretches from N. to S., a distance of 760 m., while its width varies from 115 to 280 m., and its area covers 170,000 sq. m. The shores are for the most part low, flat, and sandy, but show a cliff-like character along the face of the

Ust-Urt plateau in the N.E. and along the S., where the narrow Persian coast provinces of Gilan and Mazanderan are backed by the lofty range of the Elburz. On the W., again, the eastern extremity (Apsheron) of the Caucasus pushes itself out into the sea. Its surface lies 84 or 85 ft. *below* the level of the Black Sea, but itself fluctuates to the extent of 3 or 4 ft., according to the season. In spite of the fact that it receives the largest river in Europe, the Volga, as well as the Ural, Atrek, Kizil-Uzen, Kuma, and Terek, the Caspian is slowly shrinking, chiefly in consequence of the vast evaporation. At no very distant geological period this sea was one with the Sea of Aral, and was connected not only with the Black Sea by way of the Sea of Azov, but also in all probability with the Arctic Ocean. The bottom appears to be divided into three basins, varying in depth from 26 to 500 fathoms. Enormous quantities of sturgeon and shad are taken every year, especially in and near the estuary of the Volga. The principal seaports on the W. shore are Astrakhan, Petrovsk, Derbent, Baku, Lenkoran; on the S. or Persian shore, Resht, Enzeli, and Astrabad; and on the Asiatic or E. coast, Krasnovodsk and Mikhailovsk. Russia maintains a small fleet on the Caspian. The Manych depression or river, which runs from the Caspian to the river Don near the Sea of Azov, suggested as early as the 18th century the idea cf connecting these two seas by a canal, and various projects fcr this purpose have been suggested, the latest being one formulated in 1901 for constructing, at an estimated cost cf $21,899,250, a canal between Astrakhan and Taganrog, 150 ft. wide and 22 ft. deep. Another proposal is to connect the Don and the Volga at Tsaritsyn.

Cass, George Washington (1810–88), American engineer and railway official, was born at Dresden, O., and graduated (1832) at West Point, resigning from the engineer corps in 1836. Shortly afterward he was appointed to the engineer force to construct a national road through Md., Pa., and Va. It fell to his share in this duty to erect the first cast-iron bridge built in the U. S. He was engaged in engineering work on the Monongahela River, and drifted into the steamboat and transportation business. From 1849 to 1854 he was engaged in organizing the business of the Adams Express Company, and was its president in 1856–62. He was president of the Pittsburg, Fort Wayne and Chicago Railway in 1862–84, and of other railways for shorter terms.

Cass, Lewis (1782–1866), American statesman, born at Exeter, N. H., on Oct. 9, 1782. He studied for seven years (1792–9) in the Phillips Exeter Academy, joined his father in Ohio, crossing the Alleghany Mountains on foot, about 1799 studied law under Return Jonathan Meiggs; was admitted to the bar in 1802, and practised successfully at Zanesville. He soon entered politics, was elected to the lower house of the state legislature in 1806, and was U. S. marshal for the district of Ohio (1807–13). In the War of 1812 he served in the West, first under Gen. William Hull, in whose surrender at Detroit—at which he was indignant—he was included, and then under Gen. W. H. Harrison, participating in the Battle of the Thames (Oct. 5, 1813), and became a brigadier-general in the regular army in March, 1813. From 1813 to 1831 he was governor of the territory of Michigan, whose limits were much larger than those of the present state and which was then sparsely settled, and in this capacity he showed great administrative ability; conciliated the Indians, with whom he made a number of important treaties; built roads and made other public improvements, and encouraged exploration. Altogether his name is one of the greatest in the history of the Northwest. From 1831 to 1836 he was Secretary of War in Pres. Jackson's cabinet, and from 1836 to 1842 was the U. S. Minister to France, which position he resigned largely because of his disapproval of the Webster-Ashburton treaty, recently negotiated by Secretary of State Webster and Lord Ashburton. Before his resignation, however, distrustful as always of Great Britain, he had done much to persuade France not to give her adhesion to the quintuple treaty, by which, for the suppression of the slave trade, Great Britain sought the formal bestowal upon her of the right of search on the high seas. Cass was a Democratic member of the U. S. Senate from 1845 to 1848, and again from 1849 to 1857, taking a prominent part in debate, being conspicuous for his Anglophobia; and for opposing the Wilmot Proviso and supporting the Compromise of 1850, and the Kansas-Nebraska Bill of 1854, he received the condemnation of the anti-slavery element in the North, by which he was charged, apparently without justice, with truckling to the South in order to gain the Presidency. In 1848 he was the candidate of his party for this office, but was defeated by Gen. Taylor, and in 1852, after a close contest, he was defeated for the nomination of his party by Pierce. In 1857 he became Secretary of State in the cabinet of Pres. Buchanan. He strongly disapproved of the President's weak and vacillating policy with regard to the South after the election of Lincoln, and in Dec., 1860, he resigned because of Buchanan's refusal to reinforce the Charleston forts and to take efficient measures to secure the collection of revenue at that port. He subsequently lived at Detroit, Mich., until his death on June 17, 1866. See McLaughlin's *Lewis Cass* (1891), in the 'American Statesmen Series.'

Cassaba. See Kassaba.

Cassagnac, Adolphe Bernard Granier de (1806–80), French journalist and politician, born in the department of Gers. In 1832 he started in Paris as a journalist of the extreme type, his violent articles leading him into innumerable duels and lawsuits. He was a decided opponent of the emancipation of the slaves (1837); adverse to the revolution of 1848; allied himself with Louis Napoleon in 1852; and from that year to 1870 represented Gers in the Assembly. In Parliament as well as in the press, especially in *Le Pays*, a paper founded by him in 1866, he vigorously opposed liberal ideas and liberal reforms. After the fall of Napoleon III. he became a prominent member of the Bonapartist party. Cassagnac left several historical works: *e.g. Histoire des Classes Nobles et des Classes Anoblies* (1840), *Histoire des Causes de la Révolution Française* (1850), *Souvenirs du Second Empire* (1879–82).

Cassagnac, Paul Adolphe Marie Prosper de Granier de (1843–1904), French journalist and politician, son of Adolphe Cassagnac, was born in Paris. In 1866 he became director, and subsequently editor and duellist, of *Le Pays*. An important member of the Bonapartist party, he took a prominent part in every agitation for the overthrow of the Republic. He was a member of the Assembly almost uninterruptedly after 1876, though his otherwise brilliant oratory was marred by the violence of his language. In 1886 he founded the paper *L'Autorité*. Having deserted the Bonapartists, he was one of the committee of six who arranged with General Boulanger his *coup d'état* (1889). He is the author of *Empire et Royauté* (1873), *Mémoires de Chislehurst* (1873), *Histoire Populaire Abrége de Napoléon III.* (1874–5), etc.

Cassander (d. 297 B.C.), son of Antipater, the general, and one of the successors, of Alexander of Macedon. Cassander having seized Athens (318), put to death Olympias, Roxana, and Alexander Ægus (mother, wife, and son of Alexander the Great), and established himself in 301 B.C. as king of

Macedonia. In 315 B.C. he had rebuilt Thebes, destroyed by Alexander twenty years before.

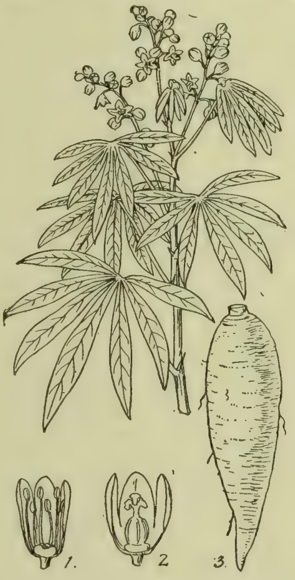
Cassan'dra, in Greek legend, one of the daughters of Priam, king of Troy, and Hecuba. After the fall of Troy she became the captive of Agamemnon, and with him was murdered by Clytæmnestra and Ægisthus after their return to Greece. She was beloved of Apollo who gave her the gift of prophecy but, on being spurned by her, ordained that her predictions should never be believed.

Cassandra (anc. *Palene*), the most westerly of the divisions of the Chalcidice peninsula, jutting into the Ægean Sea between the Gulfs of Salonica and Cassandra (anc. *Toronaicus Sinus*).

Cassatt', Mary (1845–1926), American artist, was born in Pittsburgh. In 1875 she went to Europe to study art, and in 1879 settled permanently in Paris. After exhibiting for several years in the Salon, she was invited by Degas to join in the exhibitions of the Impressionists, to which alone she subsequently contributed. Miss Cassatt's chosen field was the portrayal of women and children, in oil, water color, and etching. She was a master draughtsman, and by her remarkable technique was able to triumph over the unattractiveness of many of her models. She is represented in the Metropolitan Museum, New York; the Corcoran Art Gallery, Washington; and the Luxembourg. She was a member of the Legion of Honor. Among her best known paintings are *The Bath, Breakfast in Bed, Children Playing with a Cat, Mother's Caress, Maternity.*

Cassa'tion, Court of, the supreme judicial authority in France, whose function it is to see that, in the administration of justice by the different tribunals, the law has been properly applied. It does not enter into the merits or process of the litigation, but confines itself to the purely legal aspect of the case. The Court of Cassation was constituted by the National Assembly in 1790. Its members are chosen from among the presidents or procureurs of the court of appeal, high functionaries at the ministry of justice, law professors, and eminent members of the bar at the Court of Cassation. They are elected for life or till they reach the age of seventy-five, and are appointed by the President of the Republic upon the recommendation of the Home Secretary. The court is divided into three divisions—Court of Requests, Civil Court (both for civil suits), and Criminal Court; and to each court fifteen judges are attached, with a president in addition. Besides these, there is the first president of the entire court.

Cassava, kas-ä'va (*Manihot utilissima*), known also as Manioc or Mandioc (Brazil) and as Juca or Yuca (elsewhere in South America), a tropical shrub about 6 feet in height, with palmately divided leaves and a large tuberous root (8 to 10 in.) containing an acrid, milky juice. There are two varieties, the Sweet Cassava and the Bitter, the latter containing a poisonous principle — hydrocyanic acid — which, however, is expelled by heat.



Cassava

1. Section of male flower. 2. Section of female flower. 3. Root.

The roots of the cassava form a staple article of food in Africa and South America, having something of the taste and quality of parsnips. When freed from juice, grated, and baked, they are also eaten as 'cassava bread.' The condiment cassareep is made from the grated roots and the juice is sometimes extracted, fermented, and prepared as a beverage known as piwarry. But it is in the manufacture of starch that the cassava is of the greatest importance, that product being prepared by pulping the root, washing out the starch, and drying it. Tapioca is made from cassava starch by heating it gently on iron plates until it forms granules. In Florida the cassava is used chiefly as a feed for stock.

Cassel. See Kassel.

Cassell, kas'el, John (1817–65), English publisher, founder of the London firm of Cassell & Co., was born in Manchester. He issued the *Working Man's Friend* (1850), the *Illustrated Exhibitor* (1851), and other publications with moderate success, but it was not till he put out his *Popular Educator* (1852) and the *Family Paper* (1853) that he may really be said to have established a great business.

Cassena. See Yapon.

Cassia, kash'*a*, a botanical genus including several hundred species of herbs and trees belonging to the order Leguminosæ, natives of Africa and the warmer parts of America and Asia. The annual *C. chamæchrista*, the partridge pea, whose foliage is sensitive to the touch, and the perennial *C. marylandica* are hardy, and can be grown in gardens in sheltered, sunny places. The latter bears racemes of bright yellow flowers in late summer. The best known of the tender species is the South American shrub *C. corymbosa*, which grows to a height of eight feet, and bears corymbs of yellow flowers in summer. Senna, used in medicine as a cathartic, is prepared chiefly from *C. acutifolia*, and *C. angustifolia*. The cassia of the Bible is the spicy bark of aromatic trees belonging to the genus Cinnamomum. The best cassia bark comes from China, whence we also receive aromatic cassia buds. From the bark an oil is distilled which resembles oil of cinnamon.

Cassianus, kas-i-ā'nus, Joannes Eremita, or Joannes Massiliensis (?360–448), a Scythian monk and theologian, who spent his early life in the monastery of Bethlehem with Germanus, afterward visiting Egypt, Constantinople, where he was made a deacon (403) by Chrysostom, and Marseilles (415), where he established two religious societies, one the abbey of St. Victor. He was canonized after his death. Cassianus adopted some of the views of Pelagius, and opposed the extreme doctrines of St. Augustine and Prosper concerning original sin and human depravity. He left *Collations*, or conferences of the fathers of the desert; *Institutions*, in twelve books; and seven books on the Incarnation.

Cassin, ka-sań', John (1813–69), American ornithologist, was born near Chester, Pa., and entered business in Philadelphia (1834). Subsequently he devoted himself to ornithology, and prepared many reports for the U. S. Government, including *Ornithology of the United States Exploring Expedition* (1845), *Ornithology of Gillies' Astronomical Expedition to Chili* (1855), *Ornithology of the Japan Expedition* (1856), and the portions relating to rapacious and wading birds in the *Explorations and Survey for a Railroad Route from the*

Mississippi to the Pacific Ocean (1858). He noted, described, and classified a large number of birds not given by Audubon and Wilson.

Cassini, käs-sē'nē, Count Arthur Pavlovich (1835–), Russian diplomat, entered the public service in 1854, being appointed to a small place in the Ministry of Finance. The following year he was transferred to the Ministry of Foreign Affairs, and thereafter was regularly promoted in the diplomatic service, holding positions in all the European capitals until he was appointed Russian minister at Peking in 1891. At that court he became conspicuous as the instigator and developer of Russia's Manchurian policy, and he drafted the Manchurian convention. In 1897 he was made minister and shortly afterward ambassador to the United States. In 1905 he was transferred to Madrid.

Cassini, käs-sē'nē, a family of distinguished astronomers. Giovanni Domenico Cassini (1625–1712), was born in Perinaldo near Nice, and became professor of astronomy at Bologna (1650). His discoveries relating to the planets Mars and Venus and his settlement of the theory of Jupiter's satellites so enhanced his reputation in France that on the invitation of Colbert, he went to Paris, where he was made astronomer-royal and first director of the Paris observatory (1671–1711). His works include *Opera Astronomica* (1666), and *Origines et progrès de l'astronomie* (1693).—His son, Jacques (1677-1756), born in Paris, succeeded to his father's appointments. He was made a member of the London Royal Society (1696), and became acquainted with Newton, Halley, and Flamsteed. —Cesar François, or Cassini de Thury (1714–84), son of Jacques and grandson of Giovanni, devoted himself chiefly to geology. He published *Description géometrique de la terre* (1775), and *Description géometrique de la France* (1784), but is best known by his topographical map of France, finished in 1793 by his son, Jacques Dominique, Comte de Thury (1748–1845), who, on his retirement in 1793, terminated his family's connection with the observatory of Paris, after a period of one hundred and twenty-two years.

Cassino, kȧ-sē'nō, town, Italy, in the province of Caserta, nearly midway between Rome and Naples, 69 miles northwest of the latter. It occupies the site of the ancient Casinum, which was colonized by the Romans in 312 B.C., and has remains of a Roman amphitheatre and other ancient buildings. Down to the year 1871 it was known as San Germano. Back of the city, crowning a hill 1,700 feet high, is the famous monastery of Monte Cassino, founded by St. Benedict in 529. On the secularization of the Italian monasteries in 1866, it was declared to be a national monument, and now contains a theological seminary, as well as its own church (rich in marbles, frescoes, mosaics, and pictures), valuable library and archives, and a small picture gallery. Pop. (1921) 7,310.

Cassino, a card game, is usually played by two or four, although an odd number may play, the number being limited by the capacity of the deck of 52 cards. The dealer distributes four cards to each player, one or two at a time, the card or cards before his own being laid face up on the table. The object of the game is to take as many cards from the board as possible and is attained by pairing, combining, building, and calling. Pairing consists of taking one or more cards from the board by means of a card of the same denomination in the player's hand. Combining is done by adding the pips on any number of cards on the board to make up the number on a card in the hand of the player and then taking. Building is done by taking a card from the hand and adding it to one or more on the board to make them equal to another card in the hand. A player may not add to his build later, that is, change an eight into a ten by adding a two-spot, but an opponent may. Calling is done by grouping together a number of similar builds, combinations, or similar cards, and naming them. For instance: A player holds two eights and there is an eight, or build or combination of eight on the table, in which case he may play one of his eights upon the eight, or build or make a combination of eights and call 'eights,' when nothing but an eight can take it. Each player beginning on the left of the dealer must play to the board, or take, or make a combination or build. When the hands of four have been exhausted cards are again distributed, and so on until the pack is exhausted. The winner of the last card in the last deal takes all the cards left on the board. The game is twenty-one points and the value of points is as follows: big cassino (ten of diamonds), 2 points; little cassino (two of spades), 1 point; each ace, 1 point; the majority of the cards of the suit of spades, 1 point; the majority of all the cards, 3 points; sweeps (clearing the board of cards), 1 point. Occasionally, in building, the jack is reckoned as 11, the queen as 12, king, 13, and ace, 1 or 14.

Cassiodorus, kas-i-ō-dō'rus, Flavius Magnus Aurelius (*c.* 480–*c.* 570), Latin statesman and man of learning, was chief minister successively to Théodoric, Amalasontha, Athalaric, Theodatus, and Vitiges. After the victories of Belisarius (about 540 A.D.) he retired to the monastery of Viviers in Bruttium, which he had founded. He insisted on intellectual activity on the part of his monks, including the copying of manuscripts and the translation of Greek texts into Latin. There survive a collection of his own state papers, and a *Chronica* from the creation down to 519 A.D., with a full list of the Roman consuls.

Cassiopeia, kas-i-ō-pē'*ya*, an antique northern constellation adjacent to Cepheus, traversed by the Milky Way. Tycho Brahe's Nova blazed in its neighborhood in November, 1572. η Cassiopeiæ is a fine binary, revolving in about two hundred years.

Cassiopeia, in Greek legend, the mother of Andromeda (q.v.).

Cassiques, käsēks' (*Cassirinæ*), Central American passerine birds which construct large purse-like or pocket-like nests of grass or fibres hung in colonies from the ends of the branches of trees. They belong to the family Icteridæ, which includes the American orioles and blackbirds.

Cassiquiare. See Orinoco.

Cassiterides, kas-i-ter'i-dēz, a group of islands from which the Phœnicians procured tin. They have been generally supposed to be the Scilly Isles, but have been identified also with the adjacent coast of Cornwall, and with the islands in Vigo Bay in Spain.

Cassiterite, ka-sit'er-īt, Tinstone, or Black Tin, impure tin dioxide, SnO_2, the principal source of tin. It is black, or sometimes deep brown, in color, and is often crystallized in tetragonal crystals, which have a brilliant lustre and great hardness. Its high sp. gr. (7) greatly facilitates the washing and sorting of tin ores. 'Stream tin' is cassiterite in rounded, water-worn grains or pebbles, found among the sand and gravel of streams. 'Wood tin' has a fibrous structure. Tinstone is associated usually with granite masses, and with the veins which these send out into the rocks around them. It has been mined in Cornwall since the time of the Romans, but the industry has declined. The chief modern sources are the Federated Malay States, the island of Banca (Dutch East Indies), and Bolivia. Other producing countries are Australia, China, Nigeria, Southwest Africa, the Congo, India, Portugal, and Spain. Tourmaline frequently accompanies tinstone; topaz and lithia micas are commonly found in tin-bearing granites. Cassiterite is found in the Black Hills, S. D., Texas, Maine, Virginia, California, and Alaska.

Cassius, distinguished Roman clan. (**1.**) Spurius Cassius Viscellinus, consul in 502, 493, and 486 B.C. He founded the greatness of Rome by making (493) the league with the Latin cities, and (486) that with the Hernicans. He is also said to have proposed the first agrarian law at Rome, and for that to have been accused of aiming at monarchy, and put to death by the patricians; according to some accounts, indeed, by his own father. (**2.**) Caius Cassius Longinus, the murderer of Julius Cæsar. He fought with Pompey in the civil war, but after the battle of Pharsalia surrendered to Cæsar, who not only pardoned him, but made him prætor in 44, with the promise of the government of Syria. Yet he instigated the conspiracy against Cæsar, and was the means of securing the help of Brutus. After Cæsar's death he went (43 B.C.) to Syria, defeated Dolabella, and, after ravaging Syria and Asia, together with Brutus met Augustus and Antony at the battle of Philippi (42 B.C.). In the first engagement his troops were defeated, while Brutus was successful; and he compelled his freedman to slay him. He is well represented in Shakespeare's *Julius Cæsar*. (**3**.) Cassius Parmensis, so called from Parma, his birthplace, was also one of the murderers of Cæsar. After the battle of Philippi he joined Sextus Pompeius, then went over to Antony, and when the latter had been defeated at Actium, was put to death by Augustus (30 B.C.). He wrote epigrams and elegies, only fragments of which are extant.

Cassivelaunus, a British prince who ruled the country north of the Thames, and led the national resistance to Cæsar's second invasion in 54 B.C. He was defeated, and obtained peace by becoming tributary to Rome.

Cassock (Ital. *casacca*), originally a long military horseman's cloak, but latterly restricted to a garment worn by clergymen or other ecclesiastical functionaries. In the Roman Catholic Church its color varies—black for priests, purple for bishops, scarlet for cardinals, white for the Pope. The cassock of the Church of England clergyman is a long, black, close-fitting frock, worn under the surplice. It is only used on occasions of church service. It is sometimes worn by minor functionaries, as vergers and choristers.

Cassowary (*Casuarius*), one of the five living kinds of running birds, confined to Australia, New Guinea, and the adjacent islands. They are somewhat smaller than the allied emeus, and differ markedly from them in the presence of a bony helmet on the head, and usually wattles on the naked neck. The glossy, hairlike plumage is black; and the cock—which, as usual among running birds, incubates and takes care of the young—is smaller than the hen. The birds inhabit wooded country, often the dense scrub, and are naturally shy, though old males are fierce when brought to bay. The eggs are from three to six in number, and are of large size.

Castaldi, Pamfilo (1398–1490), Italian humanist and poet, born at Feltre in Lombardy. He founded there a school in which he taught literature and the Italian language, its great repute attracting many foreigners. Italian writers (*e.g.* Bernardi) claim that Castaldi is the real inventor of movable types, and therefore of printing; and that the secret was carried to Gutenberg by Johann Fust or Faust, who is alleged to have been one of Castaldi's pupils and intimates. It is also stated that Galeazzo Sforza granted Castaldi the privilege of establishing a press at Milan in 1472. See Bernardi's *P. Castaldi e l'Invenzione dei Caratteri Mobili per la Stampa* (1865), and Fumagalli's *La Questione di P. Castaldi* (1891).

Castalia, a spring on Mount Parnassus, near Delphi, held to be frequented by Apollo and the Muses, and thus a fount of poetical inspiration.

Castanet, a simple clapper instrument, consisting of two small concave pieces of hard wood or ivory, shaped somewhat like the capsule of a chestnut slit through the middle. The pieces are fastened together by a cord, which is slipped over the thumb of the performer, who strikes the two halves together with his fingers. Usually the player has a pair of castanets in each hand. The instrument is of Spanish origin, and it is still largely used by the Spaniards and Moors as an accompaniment to their dances and guitars. The crotalum of the ancients resembled the castanet.

Castaños, Don Francisco Xaver, Duke of Bailén (1756–1852), Spanish commander, born in Vizcaya. During the Peninsular war he co-operated with Wellington, and rendered complete the successes of Albuera, Salamanca, and Vitoria. He received his ducal title in consequence of the victory he won over General Dupont de l'Etang at Bailen (1808).

Caste. In India, class distinction, or caste—much more pronounced and rigid than among western peoples—is entirely an accident of birth. In whatever caste a man is born, in that caste he continues. Caste is the offspring of Brahmanism, and the Brahman is the central feature of the system; all others acknowledge him as lord. The origin of this marvellous institution, which, established more than three thousand years ago, still maintains its hold over the Hindu race, probably grew at first out of racial distinctions, when the earliest Aryan immigrants into India settled among the aborigines. Accordingly the pure Aryan, issuing from the Creator's mouth, was the Brahman. Next came the Kshatriya, or caste of fighting men, who were appropriately alleged to have sprung from Brahma's arms. From this caste princes and rulers were selected to govern under the counsel of the Brahman.

Vegetarian communities recognize the importance of the agriculturist, so the Vaisya—the issue of the Creator's loins—ranks third in the social scale. The degraded Sudra was the offspring of Brahma's feet. The consequent developments were so varied that it is now impossible, within a limited space, to give an exhaustive list of the endless divisions and subdivisions of the four original castes.

One of the most important 'caste prejudices' has reference to food. Members of different castes may neither eat nor drink together, and no one may partake of a dish prepared by one of lower caste than himself. Most Hindus are vegetarians; to all the cow is a sacred animal. To a Hindu loss of caste means not merely social ostracism, but excommunication from religious rights, and exclusion from sanctuaries: and few Europeans can conceive the horror with which many Hindus regard the consumption of animal flesh; and when flesh-eating leads to the sacrifice of the sacred cow, the disgust and abhorrence of the high-caste Brahman are beyond expression.

In a climate in which the pulses are deadened to activity, and the tendency is in the direction of voluptuous languor, caste has taught repression and self-control. High barriers against indiscriminate intermarriage have preserved purity of blood and intellectual ability; encouragement of hereditary trade and pursuits has led to the creation of experts. Caste is not dead. It still appeals to the people, and, whether for good or evil, it is a potent factor in British dealings with the Hindu subjects of the Indian empire. See Rev. M. A. Sherring's *Hindu Tribes and Castes* (1872–81).

Castelar, Emilio (1832–99) Spanish statesman, orator, and author, born at Cadiz; educated at Madrid University, where he afterward occupied the chair of history and philosophy (1856). Devoting himself to politics while still young, he soon acquired great influence by his eloquence and was frequently persecuted by the government for liberal sympathies. Founding (1864) *La Democracia*, he wrote with caustic bitterness against the government, and was removed (1865) from his professorship. Condemned to death after the attempted insurrection in 1866, he escaped to Paris, but returned to Spain in 1868. His advanced views were fully expounded in *Cuestiones Politicas y Sociales*, published in 1870, which was followed in 1871 by *Discursos Parlamentarios*. He largely assisted in the downfall of King Amadeus (1873), and in September of that year was appointed dictator by the Cortes, but resigned (1874). In addition to the works already mentioned, Castelar wrote a *Historia del Movimiento Republicano en Europa* (2 vols. 1872–4), *La Cuestion de Oriente* (1876), a *Life of Columbus*, (in the *Century Magazine*, 1892), a pamphlet against Cæsarism, and many minor works. See *Emilio Castelar*, by Sanchez del Real (1873); *Don Emilio Castelar*, by David Hannay (1895); and Gonzalez Araco's *Castelar* (1900).

Castelbuono, tn., prov. Palermo, Sicily, 6 m. by rail S.S.E. of Cefalu. Pop. (1901) 10,761.

Castelfranco. **(1.)** Town and episc. see of Italy, prov. Treviso, 15 m. W. of Treviso; the birthplace (1476) of Giorgione. It is still in part surrounded by its ancient walls, and in its cathedral is a Madonna by the great painter. Here the French defeated the Austrians in 1805. Pop. (1901) 12,440. **(2.)** Town, Italy, 7½ m. S.E. of Modena; engaged in silk trade. Pop. (1901) 13,484.

Castel Gandolfo, tn., prov. Rome, Italy, 14 m. S.E. of Rome, on the left shore of Lake Albano. Has a papal summer palace, built by Urban VIII. in the 17th century; also noblemen's seats. Pop. (1901) 1,980.

Castellammare. **(1.)** Town, Sicily, on the N. coast, 45 m. by rail W.S.W. of Palermo; trade in wine, olive oil, anchovies, and corn. The people—20,665 (1901)—fish for tunny and anchovies. **(2.)** C. DI STABIA, tn. and episc. see, Italy, on Gulf of Naples, 17 m. by rail S.E. of Naples; was founded on the ruins of the ancient Stabiæ, which perished at the same time (79 A.D.) as Pompeii. It is visited for sea-bathing and its sulphur baths. The people manufacture macaroni, cotton, soap, needles, etc., and prosecute fishing and shipbuilding. Exports: macaroni, green and dry fruit, cheese, and olive oil. There is a former royal villa (Quisisana), now a hotel, an arsenal, and ruins of a castle built by the Emperor Frederick II. Pop. (1901) 32,589.

Castellana, tn., prov. Bari, Italy, 8 m. S.W. of Monopoli (on the Adriatic). Pop. (1901) 11,400.

Castellanos, JUAN DE (*c.* 1510–90), Spanish poet, born at Seville, but passed the greater part of his life at Tunja, New Granada (Colombia), best known as the author of *Elegias de Varones Illustres de Indias* (1589), a rhyming chronicle of the exploits of Christopher and Diego Columbus, Bobadilla, Aguirre.

Castellon. **(1.)** Province, Valencia, Spain; area, 2,495 sq. m.; on the Mediterranean coast. Extremely mountainous, except a plain between the range and the sea. Fisheries very productive, and, with fruit-growing for export, form the principal wealth of the province. Some silver- lead, and cinnabar mines in Espadan range are worked actively, and there are factories of scarfs, mantas, saddle-bags of semi-Moorish taste. Pop. (1901) 310,828. **(2.)** C. DE LA PLANA, cap. of above prov. Fortress, 4 m. from Mediterranean, on railway from Valencia to Tarragona. A busy, prosperous place, manufacturing flax goods of all sorts. Great centre for export of oranges, wine, etc. Pop. (1901) 29,904.

Castel San Pietro, tn., prov. Bologna, Italy, 15 m. by rail S.E. of Bologna. Pop. (1901) 13,426.

Casteltermini, tn., prov. Girgenti, Italy, 16 m. N. of Girgenti; has trade in rock-salt and sulphur. Pop. (1901) 13,022.

Castelvetrano, tn., Sicily, prov. Trapani, 27 m. by rail E.S.E. of Marsala; stands in a fertile plain which produces wine, olives, cotton, silk, and flax. A few miles to the S., near the coast, are the ruins of the ancient Selinus. Pop. (1901) 24,510.

Casti, GIAMBATTISTA (1721–1803), Italian poet, born at Prato; studied at the seminary of Montefiascone. Eventually the emperor made him his court poet. Having fallen into disgrace after his patron's death, he retired to Florence, and then to Paris (1798), where he died. A complete edition of Casti's works appeared at Paris in 1838. His chief works are *Poema Tartaro* (1803), a satire on the Russian court; *Gli Animali Parlanti* (1802; Eng. trans. 1816 and 1819); *I Tre Giulj* (1762; Eng. version by M. Montagu, with a memoir of the author, 1826; another ed., *The Three Goats*, 1841). While at Vienna, Casti wrote excellent *libretti* for Paisiello and Salieri.

Castiglione, tn., Sicily, prov. Catania, at the N.E. foot (2,040 ft.) of Mt. Etna; famous for its hazel nuts. Pop. (1901) 12,998.

Castiglione, BALDASSARE, COUNT (1478–1529), Italian writer, born at Casanatico; entered the service, successively, of several Italian rulers, including Duke Lodovico Sforza (il Moro) and Pope Clement VII., for whom he went to Spain in 1525 as papal nuncio. He died at Toledo, a man of brilliant gifts, who had seen life intimately at the courts of Mantua, Urbino, Rome and Spain, England and France. Accordingly his picture of the 'perfect courtier' of his time is a notable work. The *Cortegiano* (1528; best modern ed. is that of Cian. 1894) is in the form of conversations held between ladies and gentlemen in the palace of Urbino. The style is refined and elegant, and as a contribution to the history of civilization the book is invaluable. English versions have been made by Hoby (1561; twice reprinted in 1900) and by Opdycke (1901). See *Lives*, etc., by Marliani (Introduction to the *Opere*, 1733), by Serassi (Introduction to the *Cortegiano*, 1766), by Martinati (1890), and by C. Bufardeci (1900).

Castiglione, CARLO OTTAVIO, COUNT (1784–1849), Italian philologist, born in Milan; established his reputation by the *Mémoire Géographique et Numismatique sur la Partie Orientale de la Barbarie* (1826), wherein he attempts to reveal the history of those towns in Barbary whose names are preserved on Arabic coins. With Cardinal Mai he published the Gothic version of the Old and New Testaments by Ulfilas (1819). See *Life* by Biondelli (1856).

Castile, or CASTILLE, a former kingdom of Spain, divided into Old Castile and New Castile, and occupying the central plateau of the peninsula. Old Castile, with an area of 25,372 sq. m., was in 1833 divided into the provinces of Valladolid, Palencia, Burgos, Santander, Logroño, Segovia, Soria, and Avila; New Castile (area, 27,935 sq. m.) into Toledo, Madrid, Guadalajara, Cuenca, Ciudad Real. Castile formed in the 8th century part of Leon, but in 923 became practically independent, and a hundred and ten years later received its first king in the person of Ferdinand I., son of Sancho the Great of Navarre. Ferdinand extended his dominion over Leon, Asturias, Galicia, etc., but on his death there was a division of his territories among his three sons. Alfonso VI. (d. 1109) reunited the kingdom in 1072, and Ferdinand III. (d. 1252), by capturing Cordova, Seville, and Cadiz from the Moors, further enlarged and consolidated it. In 1465 Isabella became queen of Castile, and four years later married Ferdinand, king of Aragon. After 1048 the history of Castile merges in that of Spain. The Castilians are distinguished by their haughty gravity of demeanor, their inclination to bigotry, and their lack of education. Their dialect is the official language of Spain; and Madrid, standing between the two Castiles, became under Philip II. the capital of the whole country.

Castilho, ANTONIO FELICIANO, VICOMTE DE (1800–75), Portuguese poet, born at Lisbon. Although he became blind at the age of six years, he became celebrated very young through his bucolic collection, *Cartas de Echo e Narciso* (1821). His poetical works of an elegiac character, are marked by great delicacy of feeling and by a masterly harmony of languages. We mention *Amor e Melancolia* (1828), *A Noite do Castello* (1836), *A Primavera* (2nd ed. 1837), and *O Outono* (1863). He also translated Ovid's *Metamorphoses* (1841) and *Fasti* (1859) and Virgil's *Georgica* (1865). He adapted with success several of Molière's comedies, Goethe's *Faust*, and Shakespeare's *Midsummer-Night's Dream*. See Julio de Castilho's (his son) *Memorias de Castilho* (1881).

Castillejo, CRISTOVAL DE (1490–1556), Spanish poet, born at Ciudad Rodrigo. He is one of the last representatives of the old Spanish school, and fought against the classical-Italian forms of literature which were then being introduced into Spain. His compositions, mostly of a satirical character, exhibit great versatility of form and of language, and true poetic inspiration. Many of them were circulated in MS. only, for fear of the Inquisition. The first complete edition of his works is that in the 32nd volume of the *Biblioteca de Autores Españoles* (1854). Among other works are *Diálogo de las Condiciones de las Mujeres*, a powerful satire against women; *Sermon de Amor;* and *Historia de Piramo y Tisbe.*

Castine, tn., Hancock co., Me. 29 m. S. of Bangor on a promontory in Penobscot Bay. It is the seat of the Eastern State Normal School, and has a public library. It is well known as a summer resort, has a fine harbor, ship-yards, and manufactures of cordage, brick furniture, etc. Pop.(1910) 933.

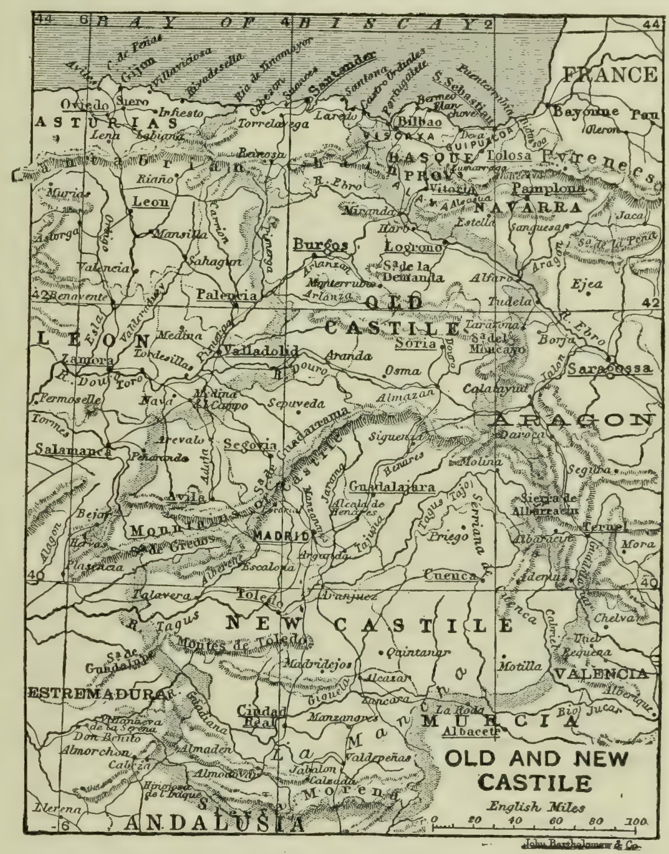
Casting is (1) a process, and (2) its product.

(1) Casting is the *process* of pouring melted metal or other fusible substance into moulds, where it cools and hardens into the shape of the mould. By a natural extension, the term is applied equally to pouring into moulds a substance rendered temporarily liquid in any other way, as by mixing with water (cement, plaster-of-Paris), or by dissolving (gelatine, sugar).

Casting of metals is so widely employed in the industrial arts that the word casting without other qualification refers to metal. A large part of the iron, brass and type-making industries depends on casting. Glass, wax, and similar fusible substances are often cast. Slag and analogous melted minerals are sometimes cast to form bricks and the like.

The details of the casting process vary with the melting temperature of the substance, its physical and chemical affinities for other substances when melted, and the nature of available mould materials. The kind of mould that can be used is an essential factor. In the case of iron and brass, the preparation of the moulds is the most important part of the art of founding, to which casting belongs (see IRON FOUNDING). Sand containing a small percentage of clay or loam is used for most moulds for iron and brass, being made slightly damp so as to hold the impress of the pattern and resist the pressure of the molten metal. Some sand moulds are baked, and those parts of moulds which serve to 'core' out interior hollows in the shape desired are nearly always baked (cores). Loam moulds are used for certain purposes, being baked before casting. In a few cases iron is cast in iron or part-iron moulds, usually to obtain a hard chilled surface, but recently (1909), by a newly developed process, for soft iron castings also (removing the castings from the mould when barely solidified, and letting cool slowly, to 'anneal' the iron). Moulds for other materials vary according to the substance being cast, chiefly according to the melting temperature and to the desired surface finish.

Casting without moulds is practised only in rare instances, as in making shot by allowing melted lead to go through a screen, from which the drops can fall far enough to harden. 'Squirting' the dissolved



OLD AND NEW CASTILE

English Miles 0 20 40 60 80 100

John Bartholomew & Co.

cellulose for incandescent-lamp filaments is an analogous process.

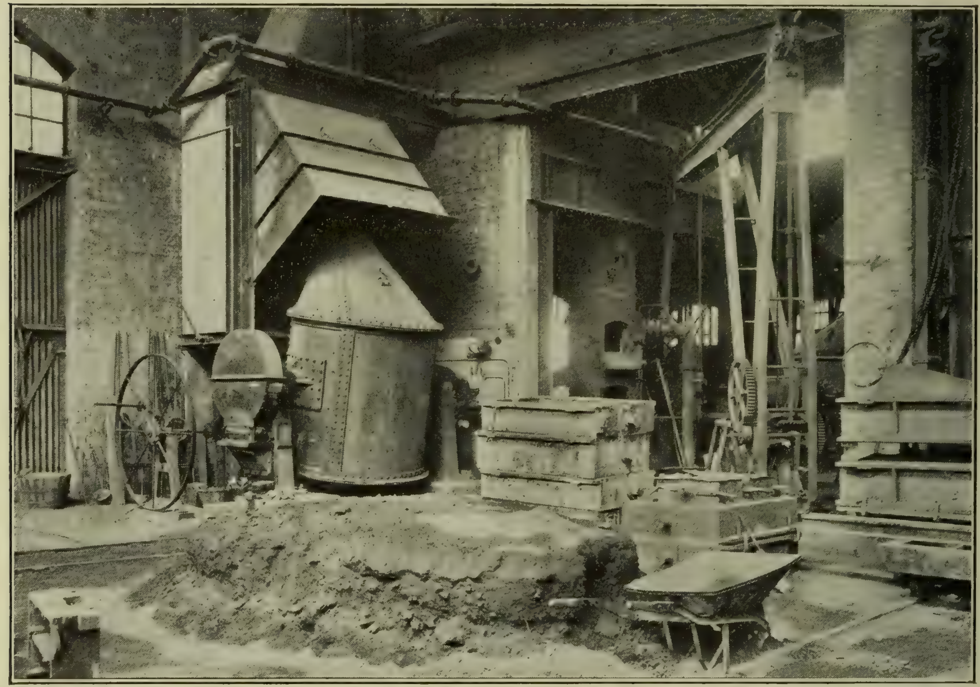
Sometimes casting serves to join two pieces. Wrought-iron or steel rods are sometimes embedded in a casting by setting them in the mould to project part way into the hollow of the mould. Joining of two pieces by casting is also done in setting anchor bolts or railing posts into a stone base, when melted sulphur or lead is run into the hole around the bolt or post.

Casting iron is the most difficult of casting processes, and its troubles are typical of those inherent in casting. The high temperature of the melted iron restricts the choice of mould substances, as noted. In melting the metal, contamination by the fuel and gases takes place, and the ready oxidation of iron by air causes a certain loss of iron. The iron that is tapped from the furnace not only contains some entrained and dissolved gases, which must separate out in either ladle or mould if the casting is to be sound, but also by its heat generates steam and gases from the material of the mould. These must be allowed to pass out of the mould freely (outward through the sand, where they burn when reaching the air), or they will burst the mould, or at best make the resulting piece porous and useless. When the actual casting has been successfully accomplished, the hot piece must cool slowly and uniformly; if one part solidifies long before the rest of the piece, the uneven distribution of contraction during cooling will warp the piece out of shape or will give rise to dangerous stresses in the finished piece. Annealing, *i.e.*, reheating the cooled piece to red heat and allowing it to cool very slowly in the oven, is a means of removing such stresses, but on account of its additional cost is seldom employed.

(2) Casting denotes also the *product* of the process, or the piece cast. Ordinarily, it means a piece of iron (cast iron) the shape of which was produced by moulding and pouring. As nearly every machine is in the main an aggregation of castings, the qualities of iron castings are influential in determining machine design.

Castings are rather rough of surface; have a hard skin, due to contact and partial fusion with the sand of the mould; are not precisely true to form; are rather brittle, and not flexible, or ductile; are weak against tensile stresses; are apt to be non-homogeneous, and may have unknown shrinkage strains in their interior. Gas bubbles or porous spots frequently occur in them. Some of these characteristics are due to the chemical composition of the metal required for easy melting. (Cast iron contains about 3% carbon, partly in combined and partly in free or graphitic form; $\frac{1}{2}$ to 1% silicon, and other impurities. Steel and wrought iron, having generally much lower impurities, are harder to melt, and would be fatally contaminated by direct contact with the melting fuel.) Other characteristics noted are due to the casting process itself.

Where castings must fit given dimensions exactly, they have to be dressed (by turning, planing, chipping, filing, etc.). For fastening together different castings by smaller joining-pieces (bolts, pins, etc.), steel must be used to obtain the necessary strength. As a consequence, also, of the brittleness of castings, riveting is never employed to join them. Broadly speaking, on account of the low strength and distinct brittleness of cast iron, a casting must have three or four times the



CASTING.—*A steel foundry with small Bessemer Converter. In foreground a finished casting still buried in the sand of the mould, the flask having been stripped off to allow it to cool.*

cross-section of an equivalent forged or rolled-steel piece. However, the great ease of forming any desired shape by the casting process makes castings absolutely essential; and since most machinery requires to be relatively massive, in order to absorb vibrations and give rigidity, it usually happens that the dimensions necessitated by this requirement are ample for strength.

Steel castings have come into considerable use, of recent years, for those purposes wherein great strength and absence of brittleness are demanded. The steel is melted in an open-hearth gas furnace, such as is used for making steel, and is poured into sand molds in the same way as cast iron. Steel castings are usually annealed, to make them soft and ductile, and get rid of shrinkage strains.

The design of both iron and steel castings is chiefly fixed by the matter of shrinkage strains. It is found highly desirable to make the thickness of metal as nearly uniform throughout a casting as possible, so that the rate of cooling after pouring may be uniform. Sharp re-entrant angles are to be avoided, where possible, because incipient cracks may be found in such corners. Thus, castings should be given well-rounded contours, filleted angles and corners, and webbed or box-shaped sections, to secure the required strength without local massing of metal. The cross-sections are to be so proportioned as mainly to experience compressive stresses. A primary object, also, is to minimize the amount of dressing or 'machining' needed for securing accurate and smooth contact surfaces.

Cast Iron. See IRON.

Castle, a term denoting a stronghold. Among Irish antiquaries, *caiseal* (pron. *cashel*) is restricted to a certain kind of walled enclosure of considerable extent, having rooms within its walls, which are of great breadth. In Great Britain, again, the word has been applied to forts surrounded by ramparts of earth, or stone, or vitrified stone; to palisaded forts, to the 'peels' of the Anglo-Scottish Borders and other towers of the same description, to brochs, and to large feudal castles. These last two instances, however, are linked together, according to Sir Walter Scott, by the keep, which he maintains to be an elaboration of the more primitive broch. (See Note L to *Ivanhoe*, and compare with plans of brochs the descriptions of the keeps of Conisborough and Barnard Castle in G. T. Clark's *Mediæval Military Architecture in England* (1884), vol. i. pp. 207–210, and 431–453.) In other countries castles have also presented a great variety of forms.

In Palestine, for example, the ruins of no less than four different kinds of castles have been found in one place—at Ta'anuk of T'ana, near Jaffa. Of these, the oldest, supposed to be Canaanite, is of unhewn stone, two are Israelite of different periods, and the latest is Arabian. The Arabian castles are of great interest from the fact that Arab influence is very perceptible in European mediæval castles. Even to-day, as Mr. Theodore Bent discovered, the castles of the Hadramaut bear a distinct resemblance to those of Europe during the middle ages. This resemblance is due not to Arab conquest in S. Europe, but to the long residence of Europeans in Syria during the crusades. The crusaders' castles in Syria were themselves of the highest interest. Of Reginald of Châtillon's castle of Kerak near the S.E. coast of the Dead Sea, it is stated that the massive walls rose to a height of 100 ft. and were in one place 27 ft. thick. Like its Eastern congeners, it displayed the features of concentric defence—an idea not properly understood by European architects prior to the crusades. This style of fortress attained its full development in England, under the direction of Edward I., although it had actually been introduced before his time; and the ruins of the castles of Conway, Carnarvon, Beaumaris, and Harlech, all in Wales, still testify to his skill. The chief characteristic of this style of defence is that an attacking force can find no spot, all along the walls, where it is free from the fire of the besieged. And further, even when the outer works have been taken, the besiegers find themselves confronted by a second and a third line of defence. The whole fortification was surrounded by a wide and deep moat—where possible, full of water. The only access to the gateway was by a drawbridge, itself protected by an outwork called a barbican. This taken, the besiegers found themselves before a portcullised gateway, behind which were heavy doors studded with iron. On either side were strong towers commanding the gateway, and above was a projecting 'machicolation,' from which molten lead, scalding water, or great weights were dropped upon the besiegers. The whole line of the outer wall was protected by bastions at every fifty yards, and bastions and walls were alike crenellated. And even if the gateway were forced or the adjoining ramparts scaled, the attacking force only found itself in the large open area called the 'outer bailey,' exposed to a heavy fire from the walls and battlemented roof or the keep, and from the gateway of the 'inner bailey.'

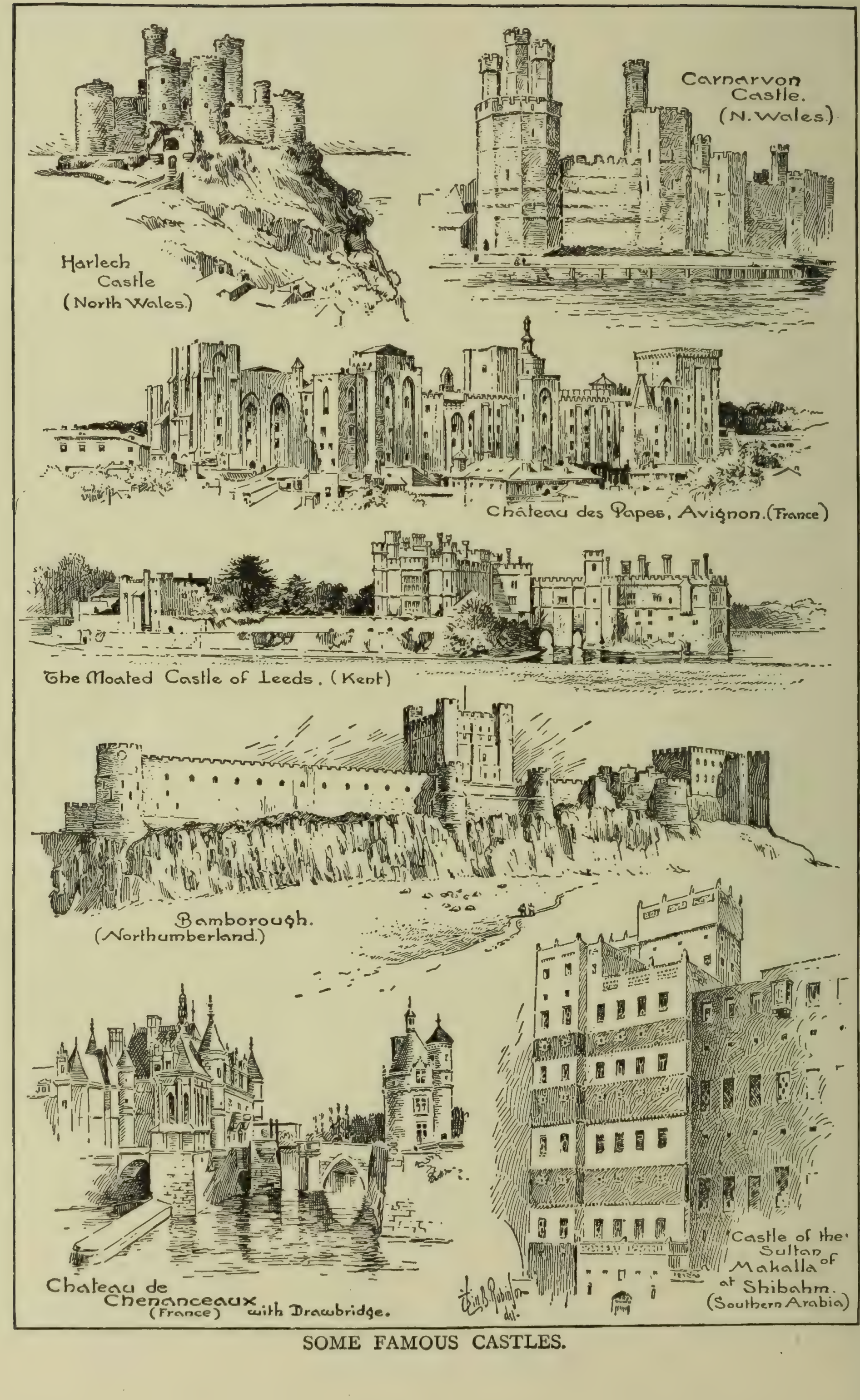
Within the enclosure last named were the barracks, the hospital, and the chapel. The great dining-hall was in the keep, the upper stories of which formed the residence of the nobleman or governor. The walls of the hall were hung with tapestry, or ornamented with scenes painted in distemper on the plastered walls and ceiling. Banners, standards, and armorial bearings, interspersed with arms and armor, further enlivened the walls. The floor, of pavement or of enamelled tiles, was strewn with rushes, scented herbs, or straw, renewed daily. A long oaken table stood in the middle of the hall, with benches on either side, and at the upper end was a silken-canopied chair of state for the lord. A wooden gallery for the musicians, placed half-way up the wall, occupied one end or corner of the hall.

After the 13th century a greater degree of luxury began to prevail in these castles, and in later centuries they imperceptibly ceased to be strongholds, their defensive features being refined away. See Clark's work already cited; M'Gibbon and Ross's *Castellated and Domestic Architecture of Scotland* (1887–92); Viollet le Duc's *Dictionnaire de l'Architecture Française* (1858–86).

Castleford, tn., W. Riding of Yorkshire, England, 3 m. N.W. of Pontefract, on the Aire. A centre for the manufacture of glass bottles, earthenware, and chemicals. Pop. (1911) 23,101.

Castle Garden, a round building in Battery Park, New York city, at the S. end of Manhattan I., originally called Fort Clinton. From 1855 to 1890 immigrants were received and examined here, but that is now done on Ellis I., New York harbor. Castle Garden is now used for an aquarium.

Castlemaine, BARBARA VILLIERS, COUNTESS OF CASTLEMAINE (1641–1709), daughter of Wm. Villiers, second Viscount Grandison. She married Roger Palmer (1659), created Baron Limerick and Earl of Castlemaine (1661). Her intimacy with Charles II. seems to have commenced a year later, and continued in the most flagrant manner till 1673. Her influence with the king was paramount, and she was instrumental in securing the dismissal of Clarendon She was created Baroness Nonsuch, Countess of Southampton, and Duchess of Cleveland (1670). Barbara Villiers spent the latter years of her life at Chiswick. She is described as a 'beautiful


Harlech Castle (North Wales.)
Carnarvon Castle. (N. Wales.)
Château des Papes, Avignon. (France)
The Moated Castle of Leeds. (Kent)
Bamborough. (Northumberland.)
Chateau de Chenanceaux (France) with Drawbridge.
Castle of the Sultan of Makalla at Shibahm. (Southern Arabia)

SOME FAMOUS CASTLES.

termagant,' avaricious, but recklessly extravagant. Her children by Charles II. were Anne, Countess of Sussex (1661); Charles, Duke of Southampton (1662); Henry, Duke of Grafton (1663); Charlotte, Countess of Lichfield (1664); and George, Duke of Northumberland (1665). See *Memoirs of Barbara, Duchess of Cleveland,* by G. S. Steinmann (1871–8).

Castlereagh, Robert Stewart, Viscount, second Marquis of Londonderry (1769–1822), second son of the first Marquis of Londonderry. He became a Tory in 1795, and in consequence was appointed (1797) keeper of the Privy Seal. He adhered at first to Catholic emancipation, but nevertheless labored assiduously with Pitt for the Act of Union. After that measure had been secured, Castlereagh was appointed president of the Board of Control (1802) in Addington's ministry, but in January, 1805, became war minister under Pitt, and afterwards held the same office in the Portland cabinet until September, 1809. The vigorous character of his policy was shown in the bombardment of Copenhagen and in the Peninsular War; but the abortive Walcheren expedition (1809) led to serious differences between him and Canning. A duel ensued between them on Putney Heath, when Canning was slightly wounded. As Foreign Secretary under Lord Liverpool, in 1812, Castlereagh became the moving spirit of the coalition against Napoleon, and the spirited campaigns of 1813–14 were practically due to him. He was England's representative at the Congresses of Châtillon and Vienna (1814–15), Paris (1815), and Aix-la-Chapelle (1818). At this period he incurred much odium at home in consequence of the drastic domestic measures of the government. He was held responsible for the 'Peterloo massacre' and the arbitrary 'Six Acts,' and also for the prosecution of Queen Caroline; was pilloried as the creature of Metternich and the agent of the Holy Alliance. He committed suicide at his seat, North Cray Place, in Kent. An excellent diplomatist, he had undoubted courage and judgment; but it is not surprising that his contempt for and harsh treatment of the people made his name a byword. See Sir A. Alison's *Lives of Lord Castlereagh and Charles Stewart* (1861), and *Correspondence and Dispatches of Lord Castlereagh,* edited by his brother, C. W. Vane (12 vols. 1848–53).

Castleton, tn., Rutland co., Vt., 11 m. W. of Rutland, on the Castleton R. and on the Del. and Hud. R. R. It is the seat of a State Normal School. Carriages and ploughs are manufactured and slate and marble are extensively quarried in the neighborhood. Pop. (1910) 1,885.

Castleton. (1.) Parish and tn. in High Peak div. of Derbyshire, England, 9 m. N.E. of Buxton. The ruin of the Castle of the Peak, built by William Peveril, natural son of William the Conqueror (see Scott's *Peveril of the Peak*), stands on a neighboring height. Castleton has interesting caves, and mines yielding fluor spar. Pop. (1901) 547. **(2.)** C. of Braemar. See Braemar.

Castor, or Castoreum, consists of the dried preputial follicles of the beaver. In the fresh state the glands contain a yellowish creamy substance, which when dried becomes dark in color. The brown resinous secretion contains a crystalline substance termed castorine, besides salicine (obtained from the willow bark which the animal gnaws), benzoic acid, phenol, and a volatile oil. These glands were formerly cut up and macerated in spirit to form a tincture which was used as a stimulant and antispasmodic.

Castor=*a* Geminorum, a bright northern star (photometric magnitude 1.6). With a third-magnitude companion it makes a stately couple, in slow revolution; first measured by Bradley in 1719.

Castor and Pollux (Gr. Polydeuces), the Dioscuri or 'sons of Zeus,' were, according to Homer, sons of Tyndarus and Leda, and brothers of Helen and Clytæmnestra. Castor was famous for his horsemanship, Pollux for his boxing; both died before the siege of Troy, but were permitted to enjoy immortality, though only on alternate days. Later stories call Zeus their father; he visited Leda in the form of a swan, and she brought forth two eggs, from one of which Castor and Pollux were born, and from the other Helen and Clytæmnestra. They were worshipped at Sparta, and thence through Greece and Italy, and were regarded as the protectors of sailors. Their worship was introduced in Rome at an early date, and it was said to be owing to their assistance that the Latins were defeated in the battle of Lake Regillus. The Roman knights revered them as their patrons. In more modern times they gave title to an opera by Rameau (1737); and Rubens's fine picture of *Castor and Pollux carrying off the Daughters of Leucippe* at Munich should also be mentioned. See J. Rendel Harris's *The Dioscuri in the Christian Legends* (1903).

Castor Oil, an oil expressed from the seeds of *Ricinus communis*, consisting mainly of the glycerol ester of ricinoleic acid ($C_{17}H_{34}O_3$), and procured chiefly from Calcutta. It is almost without color or smell, with a disagreeable acrid taste and a viscid consistency (sp. gr. .96). The dose is from a teaspoonful to two tablespoonfuls. It is seldom used pure externally, but is contained in flexile collodion and compound soap liniment. It acts as a simple purgative, stimulating peristalsis and the intestinal glands. It will also act when given as an enema. It enters the blood, and leaves the body by all the excretions, giving a purging action to mother's milk. Because of its simple, non-irritating effect, it is much to be recommended as a purgative for children. It can be given in soft, elastic capsules, of any size desired. If a lemon or orange is squeezed into a glass and the oil poured on it, the oil will float and pass untasted on the juice.

Castor-oil plant. A euphorbiaceous plant (*Ricinus communis*), from the tropics, but frequently planted for the sake of its broad, palmately lobed leaves, and richly colored stems. The seeds for which the plant is cultivated in India, are crushed to extract a demulcent, purgative oil, 'castor-oil,' which is used also in the arts. These seeds contain a poisonous principle, however.

Castra Bonnensia, Rhineland. See Bonn.

Castration (Lat. *castro*), the operation of removing the testicles of the male. One testicle may be lost through operation or disease without emasculation resulting. If the human male be castrated before puberty, he has no procreative power, and in several ways he approaches the feminine type. His beard is thin, or he has none; his voice is high-pitched and feminine, the thyroid cartilage remaining small, as in boys. On account of this effect on the voice, the operation of castration has been performed in Italy on professional singers. In Mohammedan countries it is commonly performed upon slaves, to make them safe guardians of the seraglio. When the operation is performed before puberty, it does not seem necessarily to affect the strength or stature. Mention has been made of an African eunuch in the household of a Turkish pasha. He stood head and shoulders above a crowd, and spoke with a voice like a tin whistle. If castration is performed after puberty, there is often a lapse of some time before procreative power is lost. The sufferer shows progressive changes in voice and appearance, and there is considerable risk of mental degeneracy and melancholia.

Castrén, Matthias Alexander (1813–52), Finnish philologist, born at Tervola. The publication by Lönnrot of the *Kalevala* stimulated Castrén to study the

Finnish language, and the first fruit of his labor was the treatise *De Affinitate Declinationum in Lingua Fennica* (1839). After a tour through Carelia, he published (1841) his Swedish translation of this great national epic, the metre and style of which were imitated by Longfellow in his *Hiawatha*. In 1842 he stayed in the land of the Syrjänians, a Finnish tribe between the Urals and the Pechora; and from 1845–9 participated in the Russian scientific expedition to Siberia, travelling among the Ostiaks, Samoyedes, and Buriats, and studying their languages. In 1851 he was appointed the first professor of Finnish at Helsingfors. Among his works are *De Affixis Personalibus Linguarum Altaicarum* (1850). After his death appeared *Föreläsningar i Finsk Mythologi* (1853); *Ethnologiska föreläsningar öfver Altaiska Folken* (1857); *Tillfälliga Uppsatser* (1870), in which is contained Castrén's biography; *Grammatik und Wörterverzeichnisse der Samojedischen Sprachen* (2 vols. 1854 and 1855). See *Life* by Snellman in his *Samlade Arbeten* (10 vols. 1892–1901).

Castres, tn., dep. Tarn, France, 26 m. S. of Albi, with remains of a Roman camp, on the site of which, around a Benedictine abbey, the city was built (647). During the 16th century it was an important Huguenot stronghold, but was destroyed in 1629. Soap, leather, paper, and cotton goods are manufactured. Pop. (1901) 27,308.

Castries, or Port Castries, tn. and port of entry on W. coast of St. Lucia, W. Indies. It is the capital of the island, and its harbor (British naval station) is perhaps the finest in the W. Indies. The exports include sugar, cacao, logwood, etc. Pop. (1901) 7,757.

Castriot, George. See Scanderbeg.

Castro, tn., Asiatic Turkey. See Chios.

Castro, Cypriano (1863), president of the republic of Venezuela, was born in the state of Los Andes. He is half white, half Indian (Andino), and is credited with great powers of oratory and debate. He first interested himself in local politics, and formed a party which went by the name of Castristas. But though he played a conspicuous part on the government side in the rebellion against President Palacio, fomented by General Joaquin Crespo (1892), it was not until Andrade succeeded (1898) to the Presidency that Castro came into a position of real power. Andrade soon degenerated into a despot, and in 1899 Castro took the field against him. He fought his way into the capital, Caracas, and Andrade fled to Curaçao. Castro assumed office as president on Oct. 24, 1899, and was re-elected in February, 1902. In December of that year he embroiled his country with the allied Germans and British. Subsequently he annulled most of the concessions granted to foreigners, inflicted indignities on foreign residents, declined to settle international claims, and thereby had the chief ports of Venezuela blockaded by foreign powers. In 1908, pending an ultimatum from The Hague, he went to Europe, whereupon Dr. Juan V. Gomez, the vice-president, assumed control. Castro was deposed, and was not allowed to land in South America on his return. (See Venezuela.)

Castro, João de (1500–48), Portuguese captain and geographer, born at Lisbon. Going to the Indies (1545), he crushed the ruler of Cambodia, relieved the town of Diu (celebrated by Camoens), conquered Broach and Malacca, and sent his lieutenant, Antonio Moniz, to plant additional settlements in Ceylon. Castro was appointed viceroy (1547), but died the following year at Goa, nursed to the last by his beloved comrade, Francis Xavier. He left an account of the Red Sea, *Roteiro.....da Viagem ao Mar Roxo*, not published until 1833, though there was an English translation of this work under the title, *A Rutter of Don João of Castro of the Voyage which the Portugals made from India to Zoez—i.e.* Suez (1625); *Roteiro da Costa da India* (1843); and *Roteiro de Lisbõa a Goa* (1882). See *Life* by Jacinto Andrada (1651; Eng. trans. by Wyche, 1664).

Castro del Rio, tn., prov. Cordova, Andalusia, Spain, on r. bk. of the Guadajoz, 17 m. S.E. of Cordova. It has a Moorish castle and other ruins, and has some manufactures, and trades in cattle and grain. Pop. (1900) 11,821.

Castrogiovanni (anc. *Enna*), a tn. and episc. see, prov. Caltanissetta, Sicily; is finely situated on the hollow summit of a hill (3,270 ft.), 13 m. (53 m. by rail) N.E. of Caltanissetta. It has a cathedral, founded in 1307, and an ancient citadel, and in classic times possessed a famous temple of Demeter, and another of Proserpine. Pop. (1901) 26,081.

Castro-Urdiales, tn., prov. Santander, Spain, 17, m. N.W. of Bilbao; pretty fishing port on Bay of Biscay. Exports of iron ore (1900), 688,129 tons, also of tinned sardines. Pop. (1900) 14,191.

Castro y Bellvis, Guillen de (1569–1631), Spanish poet and dramatist, a friend of both Cervantes and Lope de Vega. Though lacking in invention, he is by many critics considered to have surpassed even Calderon in pathos. His best-known works are *Las Mocedades del Cid*, and its sequel, *Hazañas del Cid*, which was adapted to the French stage by Corneille, and was republished (1890) in a critical edition by Ernest Merimée. See Lord Holland's *Life of Castro* (1817), Segall's *Corneille and the Spanish Drama* (1902), and Martinenche's *La Comédie Espagnole en France* (1902).

Castruccio-Castracani (1281–1328), Italian general, born at Castruccio, near Lucca. He became a soldier in England (1301), France, and Lombardy. His townsmen recalled him and made him their leader (1314), whereupon he defeated the Guelfs, and joined forces with Uguccione, the Ghibelline leader of Pisa. When Ludwig v. of Bavaria went to Italy in 1327, Castruccio rendered him good service, for which he was appointed Duke of Lucca, Pistoja, Volterra, etc., and Senator of Rome. His ideal was to found a great Ghibelline state in Tuscany, with Lucca as its capital. See Manucci's *Azioni di Castruccio-Castracani* (1843), and Winckler's *Castruccio-Castracani, Herzog von Lucca* (1897).

Castua, tn., Istria, Austria, 6m. N.W. of Fiume. Pop. (1900) 17,988.

Casualty. An accident. Some unforeseen circumstance in which human agency has no part.

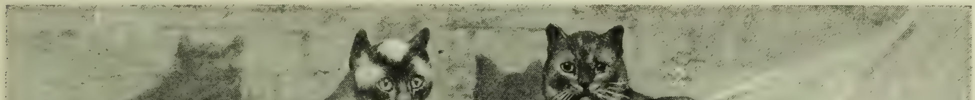
Casuarina, the name given to a genus of tropical trees and shrubs, chiefly Australian, with long, pendent, and leafless, though graceful, branches. The jointed structure of the stems gives the trees somewhat the appearance of equisetums. They are valued for their hard wood. The best-known species are *C. equisetifolia*, *C. stricta*, and *C. distyla*. The timber of some of the species is known as beef-wood in New South Wales.

Casuistry, the science which deals with difficult cases of conscience—*i.e.* which undertakes to apply acknowledged principles of conduct to doubtful cases, or cases where there seems to be a conflict of duties. The science was developed systematically by the mediæval church in the 14th and 15th centuries. (See Sidgwick's *Hist. of Ethics*, pp. 151 *ff.*; 3rd ed. 1892.)

Casus Belli (Lat. 'cause of war'). See International Law.

Caswell, Richard (1729–89), American soldier and political leader, born in Cecil co., Md. He early removed to N. C., became a lawyer and political leader there, and from 1754 to 1771 was a member of the colonial assembly, being Speaker in 1770 and 1771. He helped to suppress the Regulators in 1771, taking part in the battle of Alamance; in the American Revolution was an active Patriot or Whig; was a member of the

Continental Congress (1774–6); led the N. C. militia in the battle of Moore's Creek (q.v.); took a prominent part in framing the state constitution; was the first governor of the state (1776–9); and in the battle of Camden, as brigadier-general, commanded the N. C. troops, which formed the American centre and which soon after the beginning of the fighting fled precipitately from the field. He was speaker of the N. C. Senate (1782–4), was again governor of the state (1784–7), and in 1789 was once more a member of the N. C. Senate.



Fancy Breeds of Cats.

1. Siamese. 2. Russian. 3. Tabby. 4. Chinchilla. 5. Blue Persian.

Cat, generally the members of the mammalian family Felidæ. The cat genus (Felis) includes the most highly specialized of the carnivores. The mechanism by which the claws are retracted reaches here its highest degree of perfection, and the sharp, compressed claws are themselves exceedingly powerful weapons. The teeth are only thirty in number, as compared with the forty-two of the dog; and of these thirty, two—the last check teeth in the upper jaw (molars)—are so small as to be practically functionless. The other check teeth are all sharp-edged, and serve to cut off the large pieces of meat which are bolted by the animals without mastication. The tongue is roughened, and functions as a rasp. To this genus belong the large (lion, tiger, leopard, jaguar, etc.) and small (lynxes, wild cat, etc.) cats, often differing from one another chiefly in external characters.

The domestic cat is believed to have been derived from the Egyptian *F. caffra*, and not from the fierce wild cat (*F. catus*) of Europe, a larger and more powerful animal. In spite of prolonged domestication, the cat is less variable than the dog, and more prone to revert to a wild or semi-wild state. The chief variations are seen in color, in regard to which there are some interesting points—compare the fact that pure sandy cats are always males. For a very full account of the structure and relations of the cat, see St. George Mivart's *The Cat* (1881).

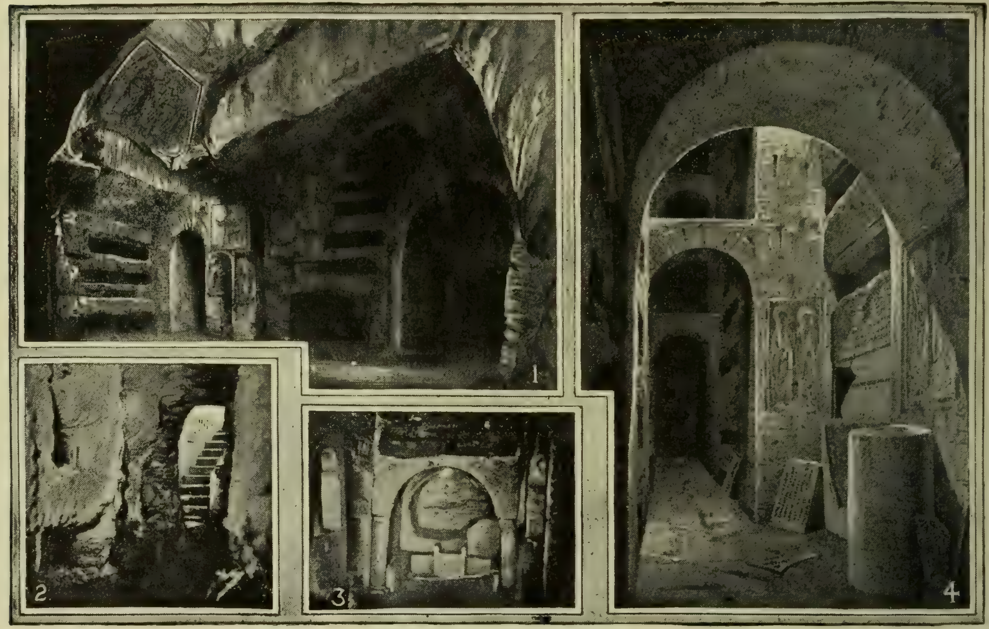
The cat section (Æluroidea) of the carnivores includes not only the true cats, or Felidæ, but also the civets (Viverridæ), the aardwolf (Proteleidæ), and the hyæna (Hyænidæ). For a general treatment of the whole group, including origin and descent of domestic cats, see E. Ingersoll's *Life of Mammals* (1906).

The Persian or long-haired domestic cat is the most popular and most 'fancied' breed. This variety is bred in many shades of color. The most valuable of these is the pale self-silver or chinchilla, of a dull silver color all over, with as little marking or shading as possible, and with green eyes. Blue Persians, or slaty animals approaching to a blue, should have a very level shade of color all over, and very deep orange or amber eyes. The elegant pure whites with blue eyes are becoming quite fashionable, and deep coal-blacks with dark-yellow eyes, creams, fawns, and orange-colored Persians are gaining favor. Other shades of the long-haired variety are brown tabby, silver tabby, tortoise-shell, and smokes.

The markings form more important points in judging the common or short-haired cats. A very interesting variety is the Siamese, said to occur in pure blood only in the palace of the King of Siam and believed to be derived from a wild species of the East. It is of a pale-cream color, with feet, lower part of legs, muzzle, and ears all black. A fine all-blue cat comes from Russia and Iceland, and there are characteristic breeds from India, Abyssinia, and other parts of the world. One of the most striking varieties is the Manx cat, originating in the Isle of Man, the peculiarity of which is the disproportionate elevation of the handquarters, and the extreme shortness of the tail.

Many societies devoted to the perfection of breeds of cats exist in Europe, and especially in England, and many shows are held annually. Recently a society of cat fanciers has been formed in the United States, and shows are annually held in New York City.

Diseases of Cats.—These are in all cases identical with the diseases of dogs. See Cherville's *Les Chiens et les Chats* (1888), Friedberger and Fröhner's *Veterinary Pathology* (new ed. 1904–5), F. T. G. Hobday's *Canine and Feline Surgery* (1900). and J. Woodroofe Hill's *Diseases of the Cat* (1901). Huidekofer's *The Cat* (1895) is an American authority on the races, training and treatment of domestic cats.



Scenes in the Catacombs.

1. Crypt of St. Cecilia. 2. A Stairway. 3. Cathedræ. 4. Sepulchres of the Popes of the 3rd Century.

Cataclysmal Action. The geologists of the early part of the 19th century were much inclined to account for all that is remarkable in the rocks or in the geological structure of a country by ascribing it to the action of powerful forces, producing great catastrophes and tremendous upheavals (cataclysms) in former geological periods, but now no longer in operation. These theories are now discredited, and an attempt is made to account for all geological phenomena by causes similar to those which we can see in action around us. This latter principle is sometimes known as uniformitarianism. See J. Hutton's *Theory of the Earth* (1795), J. Playfair's *Illustrations of the Huttonian Theory of the Earth* (1802). and Prestwich's *Controverted Questions of Geology* (1895).

Catacombs, the group of subterranean vaults and galleries in the neighborhood of Rome, memorable as the sepulchres of the early Christians. But the name is also held applicable to the Baths of Cleopatra at Alexandria, and to the underground crypts of exactly the same description as their Roman congeners, at Naples, Syracuse, Chiusi, and elsewhere.

The Roman catacombs consist of some forty or fifty groups of subterranean labyrinths or galleries and chambers cut out of the soft stone (tufa) of the hills surrounding Rome. Some of them are comparatively near the surface of the earth; but beneath these, in the majority of cases, there are successive stories of greater depth, the lowest level being at a depth of seventy feet. The number of stories may be two, three, four, or even five; and their innumerable galleries run parallel to each other, or cross each other at right angles. If the galleries in the Roman catacombs could be added on to one another in a continuous line, they would stretch for a distance of 545 miles. And yet the estimated superficial area of the catacombs is only 615 acres. Passages are so narrow (from 1¾ to 2½ ft. in width) in many cases, that it is impossible for two people to walk along them abreast, economy of space being clearly an important matter with the early excavators. The rocky walls on both sides of the passage have been hewn out into long tiers of niches or recesses, aptly compared to the berths in a passenger steamer, each niche or 'berth' having been made into a resting-place for a corpse. In some cases two bodies have been found in one niche. Each of the niches has been closed with a slab of marble or of terra-cotta, having the name of the deceased usually engraved upon it, with a pious legend attached. The language used in all the earlier inscriptions is Greek. All the later inscriptions, however, are in Latin. Eventually, in the 4th century, larger chambers were made, for the special purpose of holding religious services.

As the catacombs represent a fashion of burial previously followed by Egyptians and Jews, so the tombs of these Roman Christians present several pagan features. Ornaments, memorials, and domestic utensils are not infrequently found beside the dead body, for use in the future world, as in avowedly pagan burials. 'The arrangement of the tomb of the Scipios and those of the Christian cemetery of Domitilla [in the Roman catacombs] are so similar,' observes Dr. Joseph Anderson, 'that if there had been nothing but the mere constructional features and sepulchral arrangements to guide us in forming an opinion, they would both have been assigned to one period and one origin. The catacombs of Naples contain frescoes of purely classical design, having nothing distinctively Christian about them.' And in the catacomb of St. Prætextatus, Hermes is figured as the conductor of the dead. On the other hand, the frescoes of the catacombs are chiefly devoted to Scriptural theme. It is especially noteworthy that there are also Jewish catacombs in Rome. These were excavated about the 3rd century. They are, of course, devoid of all Christian symbolism, the seven-branched candlestick being their most frequent device. Their inscriptions are in Greek and Latin.

The most important of the catacombs are: St. Calixtus, with its *camera papale*, containing the tombs of martyred bishops of the 3rd century, and in another part Byzantine mural paintings of the 8th century; Domitilla, with 1st-century frescoes, and more than nine hundred inscriptions; St. Priscilla, with its frescoed Madonna of the 2nd century; St. Agnes, perhaps the most archaic specimen; San Sebastiano; and St. Prætextatus.

The catacombs ceased to be used as a burial-place after the sack of Rome by Alaric in 410, and during the Middle Ages their very sites seem to have been forgotten. The scientific researches of Antonio Bosio (d. 1629) and a host of later students have, however, once more brought to light their actual characteristics and their historical associations. During the past generation the work of scientific explorers has greatly added to the number of ascertained catacombs; but the discovery, in 1901, of the catacombs beneath the Monte di Dio, in Naples, was entirely due to accident. See Bosio's *Roma Sotterranea* (1632), which has had several successors of the same name, notably that of Giambattista de' Rossi (1822–94), and Northcote and Brownlow's *Roma Sotterranea* (1878–80). See also Mommsen's 'Roman Catacombs,' in *Contemporary Review*, vol. xvii. (1871). The catacombs of Paris are subterranean quarries, from which the stone for building the city was obtained. In 1787 they were first utilized for storing the bodies removed from various burying-grounds.

Catalan, group of Romance languages largely spoken in the Spanish provinces of Gerona, Barcelona, Tarragona, Lérida, Valencia, Alicante, and Castellon de la Plana, as well as in the French department of Pyrénées Orientales and the Balearic Is. Catalan is an established language, with its own grammar and dictionary, and dating from the 13th century; ranks in importance next to the Castilian, which is the official language of Spain. It is probably an offshoot of Provençal, and became a literary language between the 14th and the 16th century, attaining its zenith in the *Cants d'amor* and *Cants de mort* of Aurias March. Raymond Lully (d. 1315) and the historians Muntaner and Desclot wrote notable Catalan prose, and Balaguer and Verdaguer are the poets of the Catalan revival which dates from 1859. For language and literature, see Morel-Fatio, in Grober's *Grundriss der romanischen Philologie*.

Catalani, Angelica (1799–1849), Italian singer, born at Sinigaglia, near Ancona. She made her début as a soprano at Venice (1795), and for some thirty years was almost unrivalled. Her voice was of great power, sweetness, and flexibility, with a compass which extended to G in altissimo. After singing at Lisbon (1801–6), she went to London, where she remained until 1814, when she went to Paris and assumed the direction of the Italian Opera. In 1816 she made a tour through Europe. In 1822 she appeared again in London, and although her voice had lost its former power, she still electrified her audiences. See Ferris's *Great Singers* (1893).

Catalaunian Fields, the celebrated battlefield where the confederated peoples of Gallia, under the leadership of Ætius, defeated Attila, king of the Huns, in 451. It is generally considered to be the plain around Châlons-sur-Marne, though some authorities identify it with the plain round Metz, while yet others put it near Troyes.

Catalectic Verses, verses in which one of the normal number of syllables is omitted. Verses which contain the complete normal number are acatalectic.

Catalepsy is a nervous disorder, characterized in a typical case by loss of movement, of consciousness, and of sensation. Although it may occur in either sex, it is far more common among women than men, and commonest among young women. In cases of hysteria the cataleptic tendency may be traced to a certain definite date and cause. Suddenly, and usually without any premonitory symptom, the condition comes on. The patient falls silently, and becomes rigid in every limb, and at first it is extremely difficult to overcome the resistance of her muscles. She is unconscious, or subconscious, and insensible to pain, and the reflex movements are abolished to some extent. Later, the extreme rigidity of the muscles passes off. The arm, when bent to any position, yields readily, going just as far as it is taken, but not an inch on the patient's own initiative, and the position is retained for many seconds, or a few minutes. In this condition of unconsciousness and flexibility the patient may continue for hours or days, apparently in an ordinary, though deep, sleep, except for the peculiar muscular condition. The breathing is shallow, the heart beats slowly and softly, and the temperature tends to fall rather below normal. The patient may rouse at intervals and relapse, or, suddenly coming to her normal condition, she may show nothing more of a cataleptic tendency. Often the recovery is at once complete. In some cases consciousness returns some time before speech. There may be other departures from the typical case, such as incomplete loss of consciousness, or of sensibility to pain, or of the reflexes. The same condition may occur during hypnosis, or in atonic melancholia, or in katatonia.

Treatment.—Between attacks of hysteric catalepsy the patient must be treated as neurasthenic, and attention paid to whatever will improve the general condition and give rest to the nervous system, with, of course, special regard to the exciting cause, if it can be recognized. There are differences of opinion as to the course to adopt during the cataleptic state. There should be no attempts made to arouse the patient. If the condition be prolonged, the patient should be fed with a stomach tube. See Dana's *Text-Book of Nervous Diseases* (1905). The cataleptic state is now and then very well imitated for fraudulent purposes.

Cataloguing. Any collection of books, if constantly added to, soon gets beyond the grasp of its collector, and to enable it to be used it becomes requisite that a catalogue be prepared. This is specially true of libraries to which the public has limited or free access. 'A library is not worth anything without a catalogue,' says Carlyle. The catalogue is at every step the guide-board to the reader. It must enable one to find a book of which either the author or the title is known, and it must show all the books the library has by a given author. It must also show what it has on a given subject or in a given kind of literature. There must, therefore, be an author catalogue, in which should be included titles of anonymous books, and other striking titles. There should also be a subject catalogue, which should include form entries, such as dictionaries, periodicals, poetry, fiction. When these two catalogues are combined into one, giving authors, titles and subjects in a single alphabet, the catalogue is called a dictionary catalogue. For other types of catalogue see under *Definitions* in Cutter's 'Rules,' referred to below. Its simplicity of arrangement and the readiness with which it is comprehended by the average reader have led to a very general adoption of the dictionary catalogue in libraries, though some still separate the author and subject catalogues into two alphabets.

Printed catalogues so quickly become out of date by the addition of new books to the collections they cover that libraries have almost universally adopted the card system. In this the cataloguing is done on cards measuring 12.5 centimetres in length by 7.5 or 5 centimetres in height. These cards are alphabetically arranged in drawers in cases, and new entries are put in place as soon as ready, thus keeping the catalogue constantly up to date. From 1902 to 1906 the Library of Congress furnished other libraries its printed catalogue cards, at rates much below the cost to the libraries for making them; the saving to the libraries of the country using these cards in 1904–5 is estimated as equal to the cost to the Government of the maintenance of the entire cataloguing force at Washington for the year. The earliest English rules for cataloguing were those compiled in 1839 by Sir Anthony Panizzi, J. Winter Jones and three others, a committee of the trustees of the British Museum, for use in making the *catalogue of printed books;* these have been frequently reprinted. In 1852 Mr. C. C. Jewett, of the Smithsonian Institution, published a report on the construction of catalogues of libraries, with rules and examples. In 1870 the Boston Public Library issued a small edition of points to be considered in cataloguing. The United States Commissioner of Education published in 1876, as the second part of the report on *Public Libraries in the United States*, a code of *Rules for a Dictionary Catalogue*, prepared by Mr. C. A. Cutter, a fourth edition of which, rewritten, was issued in 1904. Through the educational influence of these rules, and of others based upon and more or less closely following them, published by the English and American Library Associations, cataloguing has become a well-defined art. 'No rules can take the place of experience and good judgment,' but the best results of both are embodied in these rules. The code issued by a committee of the American Library Association is more specially designed for use in learned rather than in public libraries.

In 1876, also, Mr. Melvil Dewey, late New York State Librarian, devised and published a scheme for the decimal classification of books in libraries. By this system the field of knowledge is divided into nine main classes, numbered 1 to 9, general works falling into no one of these classes, being assigned to a tenth numbered 0. Each class is similarly subdivided into ten divisions, each division into ten sections, and so on decimally as far as may be needed. Subjects are arranged in simple numeric order, constituting a class list which brings books on the same subject together on the shelves, and in the card catalogue as well, with books on cognate subjects in the immediate vicinity. As a relative location scheme for shelf classification, it admits of indefinite expansion and has no superior; but to make use of the card catalogue one must first consult an alphabetical index of subjects to find the class number to which the book may have been assigned. It is the most generally adopted of any scheme of classification, but many libraries (that of Columbia University among them) arrange their card catalogues in the drawers in the simpler alphabetical order of the dictionary catalogue. Mr. Cutter has also published an expansive classification for the use of libraries.

In 1893 the United States Commissioner of Education published a *Catalogue of the A. L. A. Library* of books exhibited at the World's Columbian Exposition in Chicago. The books were arranged in this catalogue on both the decimal and dictionary plans, and given the call (shelf) numbers of both the Dewey and Cutter classifications. An enlarged edition of this catalogue, covering eight thousand selected volumes for a popular library, with notes, was published by the Library of Congress in 1904. This catalogue may be followed as a model for cataloguing and for classification, as well as be used in selecting books for a library, public or private. Consult C. A. Cutter's *Rules for a Dictionary Catalogue* (Washington, 1904); *Expansive Classification* (Northampton, 1904); M. Dewey's *Decimal Classification and Relative Index* (Boston, 1904); *Card Catalogue Rules* (1894); E. C. Richardson's *Classification, Theoretical and Practical* (New York, 1901).

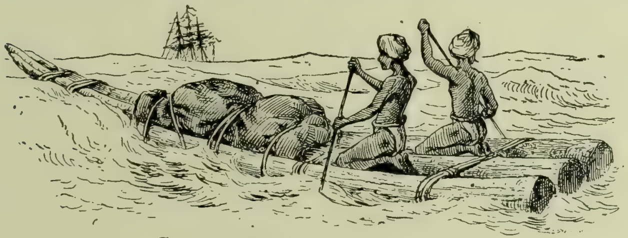
Catalonia, an old principality and province in the extreme northeast of Spain. The Pyrenees form its base, and the Mediterranean Sea and Aragon its east and west sides respectively. The district is mountainous in character. Numerous streams traverse the valleys, and these, together with a well-managed system of artificial irrigation, render Catalonia the leading agricultural district of Spain. The coast-line is bold and rugged. The Ebro, the Llobregat, and the Ter are the chief rivers. The district has since 1833 consisted of the provinces of Gerona, Barcelona, Lérida, and Tarragona, with a total area of 12,483 sq. m., and a pop. (1900) of 1,967,000. Barcelona, the capital, is the second town in Spain; other towns of importance are Tarragona, Gerona, Lérida, Reus, and Manresa. The cork oak gives rise to a great industry, and large quantities of grain are grown, but it is as a manufacturing district that Catalonia has now risen into prominence. It has extensive manufactures of cotton, woollen, and silk goods, laces, leather, and paper. The minerals worked include coal, copper, zinc, lead, and tin.

Catalonia was the Hispania Tarraconensis of the Roman conquerors. In the 5th century it was overrun by the Goths and Alani. It was under Mussulman rule in the 8th century. In 1137 it was joined to Aragon, and the two were in 1479 united to Castile; but the Catalans did not readily submit to loss of independence, and repeatedly revolted. After its conquest by Philip v., in 1714, it lost its separate constitution. The Catalan dialect, more akin to the Provençal of France than to the Castilian of Spain, is still spoken and written.

Catalpa. A genus of trees and shrubs (Bignoniaceæ), of which the best known is the Southern Indian bean-tree (*C. Catalpa*). It is frequently seen in parks, having an awkward habit of growth, with large limbs and dome-shaped head. Its foliage appears late in the spring, when in cultivation in the north, and consists of broadly ovate leaves, pubescent beneath. The flowers are large, white, mottled with yellow and purple and in showy panicles; the cylindrical fruits are long, slender, brown capsules, drooping from the tree during the winter, like so many enormous string-beans.

Catalysis. Certain chemical reactions occur at vastly increased rates in presence of a third substance (often small in quantity), which itself remains apparently unchanged. This substance is known as the catalytic agent. In the preparation of oxygen from chlorate of potash, the addition of manganese dioxide causes the oxygen to be liberated at a much lower temperature, and much more rapidly. Deacon's process for the manufacture of chlorine is based on the use of cuprous chloride as a catalytic agent, and finely-divided platinum greatly accelerates the combustion of oxygen with hydrogen.

Catamaran, a raft used in the East, particularly by the natives of the Madras and Coromandel coasts. It consists of three pieces of wood lashed together, one of which serves as a keel, and the other two serve as sides. The rowers stand or kneel, and paddle with a bamboo, and are able to carry messages or letters (which are put into a kind of leather cap) to ships which are unable to communicate with the shore on account of the surf. These craft, which sometimes carry sail, are able to live in almost any sea. When cross planks are fitted, cargo, and even ordnance, can be shipped or landed.



Catamaran of the Coromandel Coast.

A catamaran (double boat) was at one time a form of pleasure and racing boat in U. S. waters; but few are now seen. Steam catamarans have been constructed, but have never been successful.

Catamarca, an Andean prov., Argentine Republic, bounded on the N. by Los Andes and Salta, on the E. by Tucuman and Santiago del Estero, on the extreme S.E. corner by Córdoba, on the S. by La Rioja, and on the W. by Peru. Area, 47,531 sq. m. The mountainous portion of the province is barren, but the soil is fertile. Live stock, cotton, grain and fruits are produced, and there are deposits of copper. Gold, silver, lead, graphite and iron are also mined. Pop. (1903) 101,761. Cap. Catamarca.

Catamarca, SAN FERNANDÓ DE. City, Catamarca prov., Argentine Republic, in an Andean valley, 120 m. S.S.W. of Tucuman. It is the seat of a national college and has a Franciscan monastery. It is connected by rail with Córdoba. It is a trade centre and a shipping point for produce of the region, including cotton, distilled liquors, etc. Pop. (1899) 7,397.

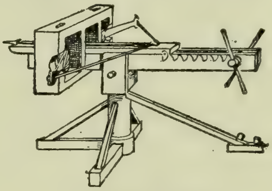
Catamount. See PUMA.

Catanduanes, isl., Albay prov., Philippines, separated from the E. coast of Luzon by Maqueda Channel. Area, 704 sq. m.; 17 dependent isls. 10 sq. m. Three mountain systems radiate from a central peak, Mt. Catilamong, to the N., S. and S.W. There are several rivers, and the soil is fertile. Abaca, rice, sesame, corn, cotton, indigo, cocoanuts and fruits are grown. Gold dust and nuggets are gathered by the natives in the streams, and live-stock raising and fishing are important industries. Birac, the chief town, is 225 m. E.S.E. of Manila. Pop. (1903), all civilized, 39,288.

Catania. (1.) Province of Italy, occupies the middle of the E. side of Sicily. Mount Etna fills its N.E. quarter, and S. of it is the fertile plain of Catania, drained by the Simeto. Behind these two regions the country is mountainous (2,250 to 4,000 ft.). It yields wheat and olives, as well as wine (40 million gallons annually), fruit (oranges, lemons, etc.), sulphur, and silk and cotton manufactured goods. Chief tn. Catania. Area, 1,917 sq. m. Pop. (1901) 705,412. **(2.)** Town and episc. see, cap. of above prov., at foot of Mt. Etna, 59 m. by rail S.W. of Messina. A place of residence for Sicilian magnates, the seat of a university (925 students in 1901) and a famous academy of natural sciences; it is also one of the chief Sicilian seaports, exporting sulphur, fruits (oranges and lemons), oil, wine, etc., and importing coal, cereals, and vegetable produce, hides, skins, etc. There is a double harbor (20 to 23 ft. water). Pop. (1901) 149,295. The Greek colony of Catana was founded in 730 B.C. by the Naxians. Hiero took it (476), and settled it anew, with the name of Ætna. The town was inundated by the tidal wave following the great earthquake of Dec. 28, 1908.

Catanzaro. (1.) Province of S. Italy; occupies the middle of the Calabrian Peninsula, and previous to 1871 was called Calabria Ulteriore II. The mountainous parts (La Sila) are mostly covered with forests, and cattle-grazing is one of the chief occupations. Corn, wine, olives, fruits, and silk are the principal products. Area, 2,030 sq. m. Pop. (1901) 476,227. **(2.)** Town and episc. see of Italy, cap. of above prov.; 110 m. by rail N.E. of Reggio di Calabria. Silk, velvet, and olive oil are the chief manufactures. Pop. (1901) 31,824. Both province and town were devastated by the great earthquake and tidal wave of Dec. 28, 1908.

Cataplasm. See POULTICE.



Ancient Catapult.

Catapult, an engine for hurling projectiles, first used as an implement of war by the ancient Romans. The larger kind was mounted on a strong wooden platform, the trigger or projector was drawn back by ropes, and then held by a catch, while the missile was placed on it prior to letting it fly. By this means very heavy rocks were projected a considerable distance. The smaller implements were carried in the hand, and used for discharging javelins, darts, etc., at close quarters.

Cataract is any opacity of the crystalline lens of the eye, with consequent diminution of vision, varying from mere dimness to a total blindness to everything save the difference between light and darkness. Cataract may occur at any age, and from various causes. It may be congenital or juvenile, traumatic (*i.e.* resulting from violence), secondary to other eye-disease, or primary; and it may be senile—*i.e.* resulting from degenerative changes not associated with any definite disease, but apt to occur after middle age has passed. Senile cataract is usually found in both eyes, though one eye may be much earlier affected than the other. Cataracts are also classified as 'hard' and 'soft'—a distinction which affects the method of treatment. Congenital and juvenile cataracts are soft; senile cataracts are hard. They may be 'stationary' or 'progressive'; there are rare cases of 'retrogressive' cataract, in which spontaneous absorption takes place. The latter are usually, if not always, the result of an involuntary operation, such as an accidental blow, which ruptures the capsule of the lens, after which the lens becomes absorbed. The immediate cause of cataract is in most cases not known. In congenital cases it tends to be associated with rickets and other disorders of nutrition. In some other cases, particularly in juvenile cataract, which is not congenital, it is the result of an injury, often a small punctured wound. It may also be secondary to degenerative changes which start in other parts of the eye and spread to the lens. It is believed that the structure of the lens renders it peculiarly liable to suffer from slight failure of nutrition.

Diagnosis.—When the cataract is advanced, a gray cloudiness of the pupil can be seen with the naked eye; but if it be only incipient, examination with the ophthalmoscope is necessary to detect it. The rate of development varies greatly. From two to three years is considered the average time for a senile cataract to 'ripen'—*i.e.* to cover the lens and prevent the distinguishing of more than light from darkness.

Treatment.—The ultimate treatment of cataract is in most cases operation. Until operation is deemed advisable, the eye can in some cases be made more serviceable by the use of weak 'mydriatics'—*i.e.* pupil-dilators; in others, specially constructed glasses add to the comfort; in yet others, though rarely, the use of 'myotics'—*i.e.* pupil-contractors—is of service. Operations are 'discission,' or needling, and 'extraction.' Discission is used for young people only, in whom the cataract is soft. A needle is inserted at the corneo-sclerotic junction, and the anterior surface of the capsule is opened. The substance of the lens is then stirred, until, gradually passing out into the aqueous humor which lies in front of the capsule, it is slowly absorbed. Extraction is performed by making an incision across the upper corneo-scleral margin; the capsule is opened anteriorly, and the lens lifted and pressed out. Both operations are, of course, performed with every antiseptic precaution.

Secondary cataracts may arise after operation, and are generally attributed to degenerative changes in the capsule, which is not removed with the substance of the lens. It has been suggested (Bates, in *N. Y. Med. Jour.*, July 7, 1900) that secondary cataract is due not to the capsule, but to fibrinous fluid, which takes the place in the anterior chamber of the aqueous humor removed by the operation. Bates advises the immediate injection of normal saline solution into the anterior chamber after the operation, and the suturing of the wound.

Catarman, pueb., Samar, Philippines, 55 m. N.N.E. of Catbalogan, at the mouth of a river on the N. coast. There is a good anchorage here. The town was destroyed in 1871 by a volcanic eruption from low land on the W. In the next four years this volcano attained a height of 2,000 ft. Pop. (1903) 9,994.

Catarrh (Gr. 'down-flow'), an early stage in the inflammation of mucous membranes, consisting of increased discharge from their surfaces, as shown in a common cold, which is accompanied by catarrh of the nasal mucous membrane.

Catasauqua, bor., Lehigh co., Pa., 3 m. N. of Allentown, on the Lehigh R. and on the Central of N. J., the Lehigh Valley and the Phila. and Read. R. Rs. It is situated in the so-called cement belt and has manufactures of iron and steel, cars, silk, shoes and tobacco. Pop. (1910) 5,250.

Catawba River, a river of N. C. and S. C., which unites with the Congaree to form the Santee R. Below Rocky Mt., S. C., it is called the Wateree. It rises in the Blue Ridge and flows E. to Iredell co., N. C., whence its course is towards the S. Its length to Rocky Mt. is 250 m.

Catawissa, bor., Columbia co., Pa., 37 m. W.S.W. of Wilkes-barre, on the l. bk. of the N. branch of the Susquehanna R., on the Pa., the D., L. and W. and the Phila. and Reading R. Rs. It has car works, machine shops, shoe, pulp and paper manufactories, etc. (1910) 1,930.

Catbalogan, cap., Samar, Philippines, on W. coast, at river mouth on shore of a bay, 328 m. from Manila. It is a port of call for the Manila steamers, and carries on a large trade in hemp and cocoanut oil with that city. The anchorage is unsafe during monsoon weather. Pop. (1903) 7,758.

Cat-bird, a name applied to two distinct passerine birds—to the American *Galeoscoptes carolinensis*, a member of the thrush family (Turdidæ), and to the Australian *Æluredus viridis*, one of the birds of paradise (Paradiseidæ). The former is one of the American mocking-birds, which have long bills and dull-colored, thrush-like plumage, and takes its name from its mewing call, but also has in spring a most sprightly and varied song. It nests in thickets, and lays dark-green eggs.

Catch-as-catch-can. See WRESTLING.

Catchfly, a large genus (*Silene*) of the pink family. Some species are viscid-pubescent, and occasionally entangle stray insects in their hairs. Among the most beautiful cultivated species are *Silene alpestris*, a dwarf, perennial, hardy, white-flowering kind, which blooms in May, and is specially suited for the rock border. *S. pendula* bears pinkish flowers throughout the summer. This species is a hardy annual, very vigorous in habit. *S. acaulis*, the cushion pink, is a dwarf alpine plant, which bears rose-colored flowers in June and July. *S. schafta* is a Persian species, about five inches in height; it bears purplish flowers in autumn. Certain species are adventive from Europe, as the fragrant, pale-flowered *S. noctiflora*, which blooms at night; the bladder campion (*S. vulgaris*), with inflated, veiny calices; and the small and purple-flowered Sweet William (*S. Armeria*). The wild pink (*S. Caroliniana*) is a common, native catchfly, which is perennial, tufted and very sticky. Its flowers range from white to rose-pink, and although found usually in dry soil, it responds wonderfully to cultivation in better environment. The fire pink (*S. Virginica*) is more slender, and has large crimson flowers. The sleepy catchfly (*S. antirrhina*) opens its pink flowers only for a short time in sunshine. *S. stellata* is a tall, showy catchfly, or starry campion, which has panicled cymes of white flowers, with fimbriated petals and inflated calices.

Catching Bargain, bargain made with an heir, reversioner or expectant, for the purchase of his interest in expectancy or reversion. Under certain conditions the court will grant relief to the heir or reversioner. See REVERSION.

Catchment Area, or DRAINAGE BASIN. See RIVER, and WATER-SUPPLY.

Cateau-Cambrésis, Le, manufacturing town, dep. Nord, France, 16 m. E.S.E. of Cambrai. The town rose slowly round the ancient palace of the archbishop of Cambrai, now turned into a factory. Textiles are spun and woven, sugar is refined, and the other industries include brewing, metal-founding, and mosaic work. Marshal Mortier was born here. Pop. (1901) 10,451.

Catechism, a treatise drawn up for instruction in the form of question and answer. The word has not in itself any exclusively theological reference, but popular custom confines the term to religious works of the required form. The first catechisms were no doubt drawn up for the guidance of catechumens or candidates for Christian baptism, and would be very short. The longer treatises of later date are connected with special movements for the spread of religious knowledge among the people. Thus, in the 8th and 9th centuries, men like Otfried of Weissenburg in Alsace, and Kero and Notker Labeo of St. Gall, prepared catechisms which were largely used as instruments of popular education. The Waldenses, the Albigenses, the Wycliffites, and the Bohemian Brethren were all active in the production of catechisms. Naturally, a movement like the Reformation was fertile in the same direction. Luther, besides a short Primer (1520), published a Larger and a Smaller Catechism in 1529. A notable catechism was that of Brenz (1527–8). Calvin also issued a Smaller Catechism (1536) and a Larger (1541). Calvin's catechisms have been superseded, even in the Swiss Church, by the Heidelberg catechism, compiled by Casper Olevianus and Zacharias Ursinus (1563). This was revised and authorized by the Synod of Dort (1619), and is accepted by the German and Dutch Reformed Churches at home and abroad. Dissent and reaction from reformed doctrine have also produced catechisms. The Socinians adopted a Larger and a Shorter Catechism at Racow in Poland (1605). The Quakers, besides one attributed to Fox (1660), have that of Barclay (1672). In the Church of Rome a catechism was drawn up by instruction of the Council of Trent, and, after several revisions, was finally accepted in 1566. This was rather a theological treatise than a catechism proper, and has been superseded in popular use by the Longer and Shorter Catechisms of Peter Canisius (1554 and 1556). Other Romanist productions are the catechisms of Bellarmine (1603) and of Bossuet (1687). The *Schema de Parvo*, a summary of Bellarmine's, was sanctioned by the Ecumenical Council of 1870. In the Greek Church, Peter Mogilas, Metropolitan of Kiev, drew up a catechism about 1640; but those now in use are the catechisms of Platon (1762) and Philaret (1839), both Metropolitans of Moscow. In England, the best-known catechism is that which is found in the Book of Common Prayer. It is in two parts, of different dates. The first, containing the baptismal covenant, the creed, the commandments, and the Lord's Prayer, was drawn up in the reign of Edward VI. The latter part, containing the doctrine of the sacraments, was written on the suggestion of James I. at the Hampton Court Conference in 1604. It is attributed to Dean Overall. A Larger Catechism, which seems to correspond to the first part of that now in use, had been published in Edward VI.'s reign. It was afterward extended (1570) by Dean Nowell. In this form it was thought too long for practical purposes, and accordingly as above stated, the previous Shorter Catechism was supplemented. In Scotland, the best-known catechisms are that of Craig, which was authorized by the Assembly in 1592, and the Larger and Shorter Catechisms of the Westminster Assembly, authorized in 1648. The Shorter is the only one now in general use. It is a clear and powerful statement of the Calvinist position, often in phrase of great majesty and beauty. In America, catechisms, when used at all, are naturally those of the European churches with which the American bodies are historically connected. See Niemeyer's *Collectio Confessionum* (1840); Schaff's *Hist. of the Creeds of Christendom* (1876).

Catechu, PALE, is an extract prepared from *Uncaria gambier*, a climbing shrub found in the Malay Archipelago. It is made from the leaves and young shoots of the plant, and comes into the market in dry cubes about one inch square. It tastes at first bitter and astringent, but afterward sweetish, and is used in medicine as a local astringent in the form of a lozenge, or as a general astringent in diarrhœa; but its chief use is in the dyeing and tanning industries. There is another substance closely related to this, termed Black Catechu or Cutch, which is an extract prepared from the heartwood of *Acacia catechu*, a tree common in India. The latter substance is not used in medicine. but only in dyeing and tanning, To prevent confusion, the term 'gambier' should be given to the former and 'cutch' to the latter.

Catechumen, one who is taught by word of mouth. Candidates for baptism were so called by the early Church. They were divided into four classes: (1) *Inquirers*, who were instructed privately; (2) *Audientes*, or hearers, who, being sufficiently advanced, were admitted to the *Missa catechumenorum*, but left after the gospel and sermon (see MASS); (3) *Prostrati*, or *orantes*, or *genuflectentes*, who shared in the worship of the congregation; (4) the *Electi*, or *competentes*, who were ready and desirous to be baptized. Owing to the dread of post-baptismal sin, many persons remained in the third class until the near approach of death.

Categorical. A categorical judgment is contrasted as one which 'asserts an actual fact absolutely' with a hypothetical judgment, which 'asserts only the consequence that follows upon a supposition.' On the question whether this distinction is to be taken as absolute, or only as a distinction between two characters that pertain in varying degrees to all judgments, see B. Bosanquet's *Knowledge and Reality*, ch. i. (1885), and the same writer's *Logic*, vol. i., pp. 94–96 (1888).

Categorical Imperative, Kant's technical term to signify the unconditional law of duty as contrasted with a command which is valid only under the supposition of an already accepted end. For example, the categorical law, 'Thou shalt not promise deceitfully,' becomes merely hypothetical if it is obeyed only in order that the agent's credit may not be injured; for the agent's interest is then the really determining ground of his action, and he no longer observes the law simply as a law of duty.

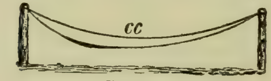
Category, a term in logic and philosophy. Its most important special uses are the Aristotelian and the Kantian.

The Aristotelian doctrine of the categories is a classification of the kinds of predicates—*i.e.* of the different kinds of assertions that may be made about a subject. These categories are ten in number, the first and fundamental being that of substance, the others adjectival predicates applicable to a thing or substance—*viz.* quantity, quality, relation, place, time, situation, possession, action, and passion.

Kant uses the term category to signify the conceptions under which, according to his theory, we must think phenomena—*e.g.* phenomena as events in time must be brought under the category of cause and effect. (See KANT.) His table of categories consists of four groups of three each—the categories of quantity (*viz.* unity, plurality, totality), the categories of quality (*viz.* reality, negation, limitation), the categories of relation (*viz.* substance, causality, reciprocity), the categories of modality (possibility, existence, necessity). Kant's categories refer only to phenomena—*i.e.* to sense experience, or, roughly speaking, to the objects of physical science. By later thinkers the term has been extended to cover any fundamental and necessary conception under which reality, whether physical or otherwise, must be thought; and thus Hegel's logic or system of categories is a metaphysic which is universal in its range. (See HEGEL.)

Catena, properly VINCENZO DI BIAGIO (*c.* 1471–1531), Italian painter of the Venetian school, a pupil of Giovanni Bellini. Though a great portrait painter, he also excelled in historical subjects. Later he imitated Giorgione. Typical examples of his fine portraits are *Count Raymond Fugger*, a patient rendering of pallid flesh (Berlin Museum), and a superb *Knight kneeling before the Madonna* (National Gallery). His religious and historical work may be seen in the Venetian churches, Academy, and Doge's Palace.

Catenary, in mathematics, is the curve assumed by a uniform flexible chain or rope when suspended from two points, and hanging freely under the influence of its own weight. Since by suitably varying the distribution of weight along a chain we may make it hang in the form of any assigned curve, which then becomes a special form of catenary, it is usual to distinguish the catenary in which the uniform chain hangs as the common catenary. As a curve it has many interesting properties, being one of the few curves for which the length of arc between two points can be expressed in terms of the positions of the points. Also, the area bounded by the arc, by the vertical lines through the extremities, and by the horizontal line which cuts across them, can be expressed by means of a simple formula. If this horizontal line is drawn at a particular distance below the lowest point of the catenary, it can be shown that the height of any point of the curve above this line is the length of chain whose weight would be equal to the tension in the hanging chain at the point chosen. Then the area bounded by the vertical line through the lowest point of the catenary, and the vertical line through the extremity of any chosen arc, is equal to the length of arc multiplied by the height of the higher extremity of the arc above the horizontal line. This particular horizontal line is called the directrix. If the chain is loaded in such a way that the weight of any part is proportional to the horizontal projection of the part, the chain will hang in a parabola. This is the particular form of catenary assumed by the supporting chains of a suspension bridge, in which the load is practically the roadway distributed uniformly in a horizontal direction, the weight of the supporting chain being negligible in comparison.



Catenary.

cc, Common catenary.

Caterpillar, the name given to the larvæ of lepidopterous insects. A caterpillar is a somewhat wormlike animal, with a distinct head, bearing strong mandibles, simple eyes, and short antennæ; a thorax, consisting of three segments, each furnished with a pair of jointed legs; an abdomen, consisting of ten segments, though some of these may be indistinct, and bearing a variable number of unjointed 'false legs' or 'prolegs.' The last of these are specially modified, and are called claspers. Internally the caterpillar displays a capacious stomach, rudimentary generative organs, and the peculiar silk-glands which open on the head and spin the threads used in forming the cocoon. Caterpillars are usually more or less sedentary—compare the imperfect sense organs and absence of wings—and as they are exceedingly voracious and expend but little energy, they store up within their bodies large supplies of food. It is these supplies which are used up during the process of conversion into the adult (*imago*); and as the adult takes but little food, it is they also which provide the stores necessary for the production of the numerous eggs. But the caterpillar's remarkable powers of assimilation render it peculiarly liable to the attacks of parasites (ichneumons), which, by reason of the reserves within the body, can go on living at the expense of their host, without producing any apparent injury during larval life. When the caterpillar's powers of assimilation are reached it ceases to feed, and passes into the pupa state. As the parasites have devoured the stores which should have supported it during this quiescent period, death ensues. Numerous caterpillars are destroyed in this way, so that the ichneumons are really useful insects in that they keep down the numbers of their destructive hosts.

Caterpillars are very variable in color and markings, and while some, such as the common cabbage caterpillars, are apparently only colored by half-digested food, others are remarkable for their bright tints or their elaborate armature of hairs or spines. Those—such as the larvæ of the clothes-moth (*Trichophaga*) and the codlin-moth (*Carpocapsa*)—which live concealed are often very maggot-like, though structurally caterpillars. For American caterpillars, see authorities mentioned under MOTHS and BUTTERFLIES; for process of rearing caterpillars in confinement, see Soule's *Caterpillars* (1901).

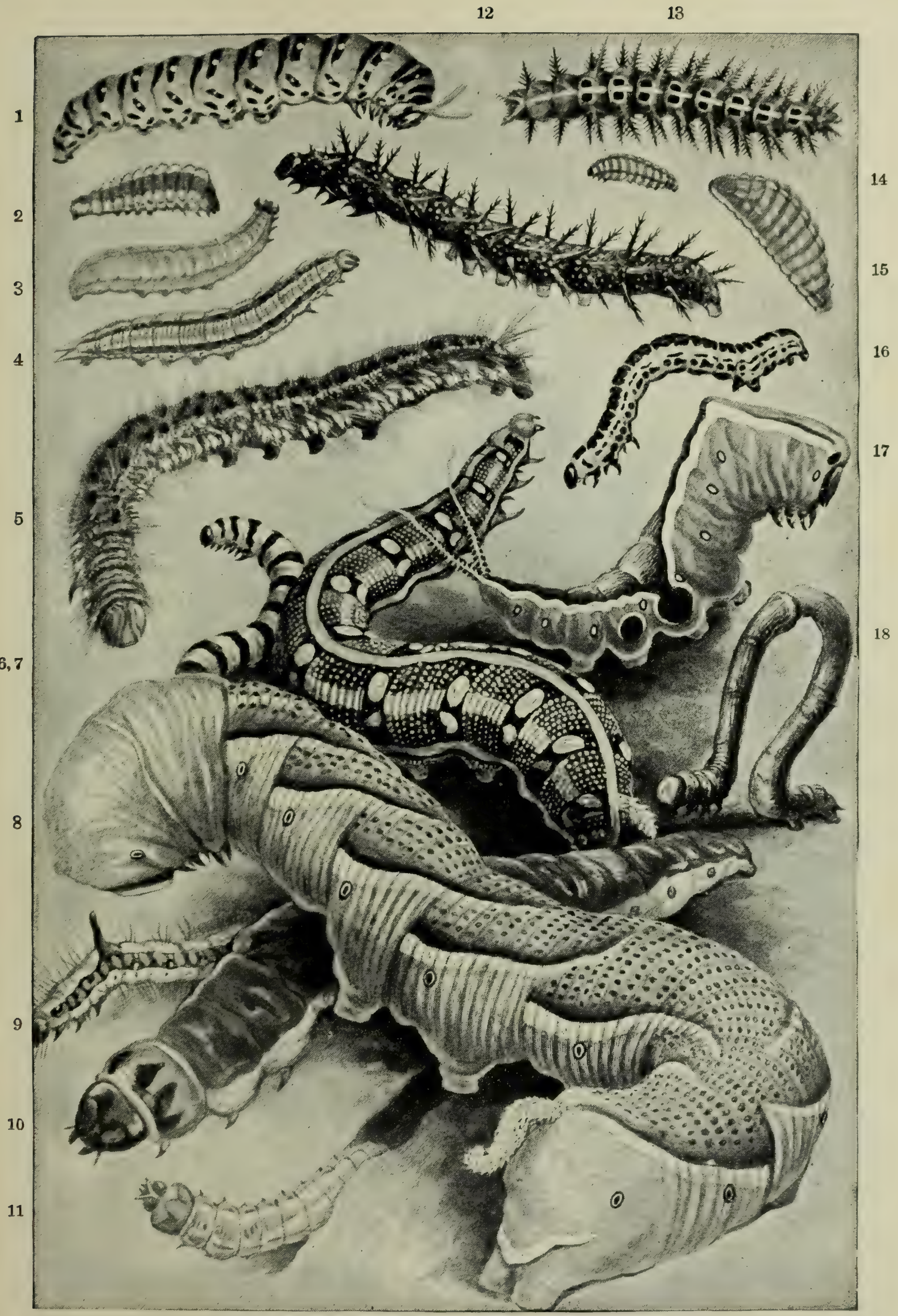
Catesby, MARK (?1679–1749), English naturalist and F.R.S., born and died in London. After travelling in N. America (1710–19) he returned to England with a collection of plants. Again he travelled to Carolina (1722–6). He published *Natural History of Carolina, Florida, and the Bahama Islands, with Observations on the Soil, etc.* (1731–43), with colored figures drawn and etched by himself. These were the first published drawings of North American animals.

Catesby, ROBERT (1573–1605) English conspirator, born at Lapworth, Warwickshire. In 1604 he joined Thomas Winter and Guy Fawkes in the Gunpowder Plot (Nov. 4, 1605), and escaping to Holbeach, Staffordshire, was there shot. See GUNPOWDER PLOT, and Jardine's *Narrative of the Gunpowder Plot* (1857).

Cat-fish (Siluridæ), a family of bony fishes in which the skin is either naked or furnished with bony plates; barbels are present about the mouth, and the air-bladder, when present, communicates with the ear by means of auditory vesicles. The skeleton shows many peculiarities: for example, the pectoral girdle is modified so as to give strength and mobility to the spine with which the pectoral fin is usually armed. The family is largely represented in America, especially in warm latitudes, where these fish live mainly in sluggish waters, and feed near the bottom. Some reach a large size, and are liked as food, but most of them are moderate or small in size, and regarded as uneatable or of little value. Some notable foreign cat-fishes are the 'wels' (*Silurus glanis*) of the Germans, a large fresh-water fish, found in certain of the rivers of Europe; the 'electric cat' (*Malapterurus electricus*) of Africa, the species of *Doras* and *Callichthys* from South America, and others.

Catgut, the material used for violin, guitar, and harp strings, for stringing rackets, and other similar purposes, is commercially obtained, not from the small intestines of the cat, but from those of the sheep, and also, for the rougher purposes, from those of the horse. The intestines are cleaned, then soaked in water until the external membrane can be scraped off; this, which the French call *filandres*, is used for rackets. The inner membrane of the small intestines is steeped in an alkaline solution of potash, and is then drawn through holes in a metal plate or thimble, to regulate the thickness and to insure the circular section.

Cathari (from Gk. *katharos*, 'pure'), dualistic heretics of the middle ages, who perpetuated the teachings of the Manichæans and Paulicians, if they did not owe their origin directly to them. Their name seems to have been assumed because of a supposed purity of doctrine and life, but was applied to them by their opponents in irony (*cf.* the English 'Puritans'). They appeared near



TYPES OF CATERPILLARS.

1. Papilio. 2. Polyommatus Adonis. 3. Thanaos. 4. Hipparchia. 5. Odonestis. 6. Callimorpha. 7. Deilephila (euphorbia sphinx). 8. Acherontia (death's-head moth). 9. Acronycta Psi. 10. Cossus (wood-eating goat moth). 11. Trochilium (a burrower). 12. Vanessa. 13. Argynnis. 14. Polyommatus alsus. 15. Thecla. 16. Abraxas. 17. Cerura (sphinx). 18. Ourapteryx (geometrid, or measuring-worm).

Turin about 1035, and several were condemned at Goslar in Germany in 1052. Before this they had been found in France, whence they spread into Spain and Flanders. The Crusaders found them in Eastern Europe in the twelfth century, where they were known as *Bogomiles* (q.v); probably they originated in the Balkan Peninsula. Under the name of *Patarenes* they became prominent in Northern Italy, and spread thence over the entire country and Sicily, but disappeared about 1400. In Germany they are not mentioned after 1231. They attained to no importance in England, though a few are known to have been there in 1159 and again in 1210.

The Cathari held that matter is intrinsically evil and the source of all evil; that men's bodies are evil and the product of the evil principle. They accepted the New Testament, but in a translation differing considerably from the Vulgate, and held certain apocryphal books in great esteem. They aimed by an ascetic life to free themselves from the power of the body; and the more advanced abjured all animal food as well as wine and marriage. In France they were confounded with the Albigenses (q.v.).

Catharine. See CATHERINE.

Carthartics. See PURGATIVES.

Cathay, ka-thā', the name given by Marco Polo to the Chinese Empire. It is derived from Khitan or Khitai, which designates several Mongolian tribes who conquered the northern part of China and ruled over it till 1123. See CHINA.

Cath'cart, suburb of Glasgow, Scotland.

Cathcart, SIR GEORGE (1794–1854), British general, son of Sir William Cathcart (q.v.). He joined the army in 1810 and served with the Russians as aide-de-camp in the campaigns of 1813 and 1814, and under Wellington at Quatre Bras and Waterloo. From 1818 to 1846 he served in Prussia and in Canada, in 1846–51 was deputy-lieutenant of the Tower of London, and in 1852 was appointed governor and commander-in-chief of the Cape of Good Hope, where he brought to a close the Kaffir War. Appointed adjutant-general (1853), he served in the Crimea and was killed at Inkerman (November, 1854). He is the author of *Commentaries on the War in Russia and Germany in 1812-13* (1850).

Cathcart, SIR WILLIAM SCHAW (1755–1843), British general and diplomatist, first Earl Cathcart and Baron Greenock, was born in Petersham. He fought in the Revolutionary War in America (1777–80), in Flanders and Germany (1805), and was created Viscount Cathcart in 1807. He commanded the Copenhagen expedition (1807) and became ambassador to Russia (1813–20).

Cathe'dral, primarily the throne of a bishop, placed in the apse of his church, called in Greek his *kathedra* ('seat'); hence the church was designated as a cathedral church, and in the tenth century the noun cathedral appears, meaning the *seat* of a bishop. Cathedrals vary in rank with the dignity of the see to which they belong, and may be episcopal, archiepiscopal, metropolitan, or patriarchal.

In the United States there are cathedrals in all the Roman Catholic and in most of Protestant Episcopal dioceses. The finest cathedral in the country is that of St. John the Divine (P.E.) on Cathedral Heights, New York City. The Roman Catholic St. Patrick's Cathedral (q.v.), New York City, was begun in 1858 and completed in 1889 at a cost of over $2,500,000.

The following are the chief cathedrals of European countries:

Italy: Bari, Bologna, Como, Ferrara, Florence, Lucca, Milan, Modena, Orvieto, Palermo, Piacenza, Pisa, Siena. For St. Peter's at Rome see the article SAINT PETER'S.

Germany: Bonn, Cologne, Freiburg, Mainz, Ratisbon, Speyer, Ulm, Worms.

Austria-Hungary: Vienna.

France: Amiens, Beauvais, Bourges, Chartres, Laon, Lyons, Notre Dame at Paris, Noyon, Orleans, Le Puy, Poitiers, Rheims, Rouen, Strassbourg, Tours, Troyes.

Spain: Barcelona, Burgos, Granada, Leon, Salamanca, Seville, Tarragona, Toledo.

Belgium: Antwerp, Brussels, Ghent, Louvain, Malines, Tournai.

The following list gives the Established Church cathedrals of *England and Wales.* See separate article on ST. PAUL'S CATHEDRAL, London.

Canterbury (Archbishop)
York (Archbishop)
London (St. Paul's)
Durham
Bangor
Bath and Wells
Birmingham
Bradford
Bristol
Carlisle
Chelmsford
Chester
Chichester
Coventry
Ely
Exeter
Gloucester
Hereford
Lichfield
Lincoln
Liverpool
Llandaff
Manchester
Monmouth
Newcastle
Norwich
Oxford
Peterborough
Ripon Minster
Rochester
St. Albans
St. Asaph
St. David's
St. Edmundsbury and Ipswich
Salisbury
Sheffield
Sodor and Man
Southwark
Southwell Minster
Swansea and Brecon
Truro
Wakefield
Winchester
Worcester

For further information see articles on the cities mentioned. For the clergy of a cathedral, see CANON; CHAPTER; DEAN. For cathedral architecture, see ARCHITECTURE.

Consult F. H. Allen's *The Great Cathedrals of the World;* Wilson's *French Cathedrals;* Pratt's *Cathedral Churches of England* (1910); Gade's *Spanish Cathedrals* (1911).

Cathelineau kȧ't'-lēnō, JACQUES (1759–1793), French insurgent general, was born in Pin-en-Mauges. An ardent royalist, he became leader of the Vendéans, put himself at the head of a handful of stubborn recruits, and became famous for his military exploits, the greatest of which was the storming of Cholet. As a commander in the Revolution, he took Nantes, but was mortally wounded by a musket ball, and his troops were dispersed.

Cath'er, WILLA SIBERT (1876–), American author, was born in Winchester, Va. She was educated at the University of Nebraska (B.A., 1898; LITT.D., 1917), and was granted the honorary degree of LITT.D. by the University of Michigan (1924). From 1906 to 1912 she was associate editor of *McClure's Magazine.* Her publications include: *April Twilights* (1903); *The Troll Garden* (1905); *Alexander's Bridge* (1912); *The Bohemian Girl* (1912); *O Pioneers* (1913); *The Song of the Lark* (1915); *My Antonia* (1918); *Youth and the Bright Medusa* (1920); *One of Ours* (Pulitzer prize novel, 1922); *A Lost Lady* (1923); *The Professor's House* (1925); *My Mortal Enemy* (1926); *Death Comes for the Archbishop* (1927).

Catherine, kath'er-in, ST., the name of several saints in the Roman Catholic Church. (1) ST. CATHERINE, virgin and martyr, commemorated Nov. 25, is said to have been of royal parentage, and to have lived at the end of the third century. She was martyred at Alexandria under the Emperor Maxentius in 307 or 312, being bound to a spiked wheel. Hence the *Catherine wheel,* with which she is commonly represented. She is one of the most highly honored saints in both the East and the West, and her legend has an important place in art. She is the patroness of philosophers and learned schools. (2) ST. CATHERINE OF SWEDEN, abbess of Wadstena (died 1381), commemorated on March 22. (3) ST. CATHERINE OF BOLOGNA, abbess of the convent of St. Clares, Bologna, who died in 1463, commemorated March 9. (4) ST. CATHERINE OF GENOA, noted for her devotion to the sick, especially during the plague of 1497–1501. She died in 1510 and is commemorated March 22. (5) St. Catherine de Ricci of Florence (1522–1590), entered the Dominican nunnery of St. Vincent at Prato, commemorated Feb. 13. (6) St. Catherine of Sienna (1347–80), one of the most famous saints of the Dominican Order, which she entered in early youth. She was a mystic and ascetic who practised the most extreme self-mortifications, believed that she saw visions and had the gift of prophecy, and claimed to be the bride of Christ and to bear the stigmata of his wounds on her body. She played a part in the politics of her day, and the return of the Pope from Avignon to Rome (1377) may be partially ascribed to her influence; the Florentines used her services in their negotiations with Gregory xi. She was canonized by Pope Pius ii. (1461); her day is April 30.

Catherine I. (*c.* 1680–1727), wife of Peter the Great (q.v.), and empress of Russia, was a peasant's daughter, and married a Swedish dragoon. She afterward attracted the notice of the Emperor, and after being for some years his mistress, was privately married to him in 1707, the marriage being publicly avowed in 1711. Catherine was solemnly crowned in 1712, and on the death of Peter in 1725, she was acknowledged Empress of All the Russias.

Catherine II. (1729–96), empress of Russia, daughter of a Prussian field marshal, was born in Stettin, and selected by the Empress Elizabeth in 1745 as the wife for the heir to the Russian throne. Her husband, on his accession to the throne in 1762, endeavored to divorce her, but Catherine, who had won the favor of the clergy and the army, was able to organize a conspiracy against him, which ended in his being dethroned and murdered in 1762.

Becoming sole ruler, Catherine governed her empire with great energy, her reign being second only to that of Peter the Great in importance. She organized the administration of the country, dividing it into fifty governments (provinces) in 1775; amended the taxation; created banks; encouraged agriculture (she introduced into Russia the cultivation of potatoes); attracted foreign colonists, especially Germans; and founded towns which bear her name. The army was reorganized, and its discipline improved. In 1785 she regulated the privileges of the nobility, and the bourgeoisie were given a special status in the organization of the municipalities. She founded a college for surgeons, as well as hospitals (especially the famous hospitals in Moscow) and military schools. She endeavored also, at the beginning of her reign, to promulgate a general code of laws. She sought, but in vain, to introduce into Russia a complete system of education. She founded the Academy, and herself wrote several comedies. In all her reforms she was animated by the spirit of the French philosophers of the eighteenth century, being in close touch through correspondence with Grimm, Voltaire, and others; while she attracted Diderot to St. Petersburg.

The prodigalities of Catherine's numerous favorites roused bitter discontent, and several pretenders appeared, claiming to be Peter iii. (*e.g.*, Pugacheff). Catherine waged war with Turkey (1772 and 1792) and with Sweden (1790), and after each of these, as well as through the successive partitions of Poland, added to the extent of her empire. Putting aside her loose private life and her numerous favorites—among the earliest being Stanislas Poniatowski, last king of Poland, and among the latest Potemkin—she fully deserves the title of 'Great' which has been bestowed upon her, though in her last years the excesses of the French republic filled her with distaste for the liberal ideas of her earlier life.

See Russia, *History*. Consult W. Tooke's *The Life of Catherine II.*, Capefigue's *La Grande Catherine;* Bury's *Catherine II.* (1900); Waliszewski's *The Romance of an Empress;* Sergeant's *Courtships of Catherine the Great;* Gribble's *The Comedy of Catherine the Great* (1912). Anthony's, *Catharine the Great* (1926).

Cetherine Archipelago. See Aleutian Islands.

Catherine de' Medici, de mā′de-chē (1519–89), queen of France, was born in Florence. She was married to Henry, Duc d'Orléans, afterward Henry ii. of France, but played no great part in French politics till 1559, when the first of her three sons, who all ruled over France, ascended the throne as Francis ii. Opposed to her she found two parties, each as strong as the crown—the Guises and the ultra-Catholics on the one hand, and the Protestants, under Henry of Navarre, on the other. For the Protestants she had no liking, as the doctrines of Calvin were not favorable to absolutism, at which she aimed; but none the less she entered into an alliance with them against the Guises, until the Treaty of Amboise (1563) showed that they had become too strong. She then entered into an alliance with Spain and the Guise party for the extirpation of heretics, which resulted in the Massacre of St. Bartholomew (see Bartholomew, Massacre of St.). During the reign of her second son, Charles ix. (1560), and still more during the reign of her third son, Henry iii. (1574), she was virtual ruler of France. Her policy was Italian in its shiftiness, and she probably injured the royal cause by oversubtlety; but in spite of this, and in spite of her heartlessness and cruelty, she tided the kingdom over a period of grave difficulty. See France, *History*. Consult Sichel's *Catherine de' Medici; Lettres de Catherine de' Medici* (ed. De la Ferrière, 6 vols.).

Catherine of Aragon, (1485–1536), first wife of Henry viii. of England, was the youngest child of Ferdinand and Isabella of Spain. She was first married to Arthur, eldest son of Henry vii., in 1501, but was soon left a widow; and in 1509, by a papal dispensation, was married to her brother-in-law, afterward Henry viii. (q.v.). Though he fell in love with Anne Boleyn in 1522, it was not till 1529 that Henry began to entertain doubts of the legality of the papal dispensation which had enabled him to marry Catherine and prevented him from marrying his mistress, Anne Boleyn; but since the Pope proved obdurate, and would not decree a divorce, Henry viii. broke with Rome, and Cranmer in 1533 declared the parties no longer man and wife. Consult Hume's *Wives of Henry VIII.*

Catherine of Bragan′za, (1638–1705), queen-consort of Charles ii. (q.v.) of England, daughter of John, duke of Braganza (afterward king of Portugal), and Louisa de Gusman, daughter of the Duke of Sidonia. She married Charles in May, 1662, and brought him the island of Bombay as part of her dowry. She resided in England until 1692, when she returned to Portugal.

Catherine of France, or of Valois (1401–38), daughter of Charles vi. of France. In 1420, in accordance with the Treaty of Troyes, she became the wife of Henry v. of England. Her second marriage (1423) with Owen Tudor gave rise to the Tudor line of English sovereigns.

Catherine of Sienna, St. See Catharine, St.

Cath′erwood, Mary Hartwell (1847–1902), American author, was born in Luray, O., and received her education at the Granville, O., female college. She then removed to Newburgh, N. Y., and began to write for various periodicals. In 1887 she was married to James S. Catherwood and removed to Illinois. She wrote a series of historical novels depicting the customs and manners of the French Canadians, including *The Romance of Dollard* (1889), *The Story of Tonty* (in which La Salle figures), and *The Lady of Fort St. John*. She gives delightful pictures of the district around Hoopeston, Ill., where she lived, in *Old Kaskaskia* (1893), and *The Spirit of an Illinois Town* (1897). Her more purely historical works consist of *The Days of Jeanne D'Arc* (1897), and *Heroes of the Middle West* (1898).

Cath'eter, a tube, formed of one of several different materials, and made in various sizes, for introduction, *e.g.*, into the bladder for the purpose of removing urine, or into the Eustachian tube when obstruction is suspected there. The Eustachian catheter is always rigid, curved for introduction through the nose, and made of silver or silver plated. Air is forced through it into the Eustachian tube, and in that way the tube is kept open during catarrh, or reopened (if possible) when inflammation has brought its walls together. Catheters for drawing off urine may be rigid, or of different degrees of flexibility, according to their material, from the stiff silver instrument to that made of soft rubber, with intermediate degrees of flexibility in those made of coated silk webbing, celluloid, and gum elastic. The flexible varieties are softened by hot water, so that they can be bent to the desired curve before use; and a wire stylet preserves the curve until the instrument has been introduced, after which the stylet is withdrawn.

Cath'etom'eter, an instrument of precision for the accurate measurement of small vertical displacements or differences of height. It consists of an upright bar, which must be adjusted to a truly vertical position, and on which a telescope, kept always parallel to itself, moves up and down. The difference of level of two observed points is shown on the vertical scale engraved on the upright bar, the final refined measurements being made by means of the cross wires and micrometer eyepiece of the telescope. As an illustration of the use of one form of cathetometer, we may refer to the determination of the index error and the error of capillarity in standard barometers. The barometer to be tested is placed in a vacuum chamber alongside a standard, and its indications are observed with the cathetometer and compared with the measurements as given by the standard.

Cath'ode. See ANODE; ELECTROLYSIS.

Cathode Rays. See VACUUM TUBES.

Catholic Apostolic Church. See IRVING, EDWARD.

Catholic Church. The term catholic literally signifies 'universal.' It was first employed from about 160 A.D. to mark the difference between the orthodox 'universal' Christian church and heretical bodies. The Church of Rome has always laid claim to the title, on the ground that it is the only pure channel of the faith. For a full account of the Church of Rome, see the article ROMAN CATHOLIC CHURCH.

Catholic Emancipation. In Protestant countries, after the Reformation, penal regulations, and in some cases civil disabilities, were imposed on Roman Catholics. For instance, the celebration of the mass was in England felony in a foreigner, and high treason in a native. In both England and Ireland Roman Catholics could not purchase land, and where they held it by inheritance could be summarily displaced by the nearest heir, being Protestant; and Roman Catholics were not deemed fit to act as guardians even of Roman Catholic children.

The earlier measures taking the education of the children of Roman Catholics out of their parent's hands fell into abeyance in the seventeenth century; but no formal proposal was made till 1780 to remove even the more monstrous of these penal disabilities. In that year Parliament passed a bill freeing from the more oppressive disabilities those Roman Catholics who were prepared to take a test oath in which, among other things, the temporal jurisdiction of the Pope in England was denied. Further relief was granted in 1791, and extended to Scotland in the following year. In Ireland, where these laws were carried to the greatest extreme, Grattan moved for repeal in 1780, and the Irish Rebellion of 1798 was largely due to continued enforcement of them. A certain amount of logical force had been given to the demand for repeal by the concessions which were made by the Treaty of Paris (1763) to the French Canadians, who consequently enjoyed full civil rights which were denied to native Roman Catholics at home.

A Roman Catholic association was formed in Ireland in 1824, and Daniel O'Connell lent to the agitation the magic of his eloquence. In 1829 the Duke of Wellington at last introduced a measure which threw open to Roman Catholics the Houses of Parliament and most public offices. Many of the minor restrictions which even then remained have since been removed. Roman Catholic bishops have been tacitly allowed to assume territorial designations. On the coronation of Edward VII. the Coronation Oath came under discussion, but nothing was done. In 1911, however, on the accession of King George, a form of oath was devised less offensive to the susceptibilities of Catholic subjects (see CORONATION). As the law stands, the sovereign, the regent (when there is such), the lord chancellor, and the lord high commissioner to the Church of Scotland must not be of the Roman Catholic faith. See TEST ACTS.

Catholic Epistles, or GENERAL EPISTLES, a title given to the seven letters in the New Testament traditionally associated with the names James, Peter (2), John (3), and Jude, and intended to indicate a feature which, common to them all, distinguishes them from the Epistles of Paul—*viz.*, their being addressed, not to any particular church or individual, but to Christians at large.

Catholic Knights of America, founded by Archbishop Feehan, when bishop of Nashville, in 1877, is a benefit society for Roman Catholics in the United States. It provides them with the usual advantages of fraternal organizations, and women are admitted to membership on the same terms as men. There were in 1916 27 State councils, 513 subordinate councils, and 18,542 members. Benefits dispersed in last fiscal year, $558,979. Supreme secretary, Henry Siemer, St. Louis, Mo.

Catholic League, formed by the Catholic princes of Europe at Munich in 1609 to counteract the Evangelical Union formed by the Protestant princes in the previous year. Maximilian, duke of Bavaria, led the League, and Frederick IV., elector palatine of the Rhine, led the Union, which became very powerful after its alliance with Henry IV. For a time war was imminent, but the murder of the French king in May, 1614, left it too weak to attack.

Catholics, Old. See OLD CATHOLICS.

Catholic Summer School of America, founded 1892, is an educational institution modelled on the Chautauqua summer school, which meets every year from July to September at Cliff Haven, on Lake Champlain, New York. It is an offshoot of the Catholic Education Union, and gives the Roman Catholic point of view in its popular lectures on many subjects. Reading circles and study clubs continue the work of the School through the year. The School publishes *Mosher's Magazine*.

Catholic Truth Society, established in England in 1872 to assist both Roman Catholics and Protestants in obtaining a better knowledge and practice of the Roman Catholic Church by disseminating suitable works of instruction and devotion. Organizations on similar lines have been established in many other countries, including the United States.

Catholic University of America, a Roman Catholic institution of higher education, located in Washington, D. C., was incorporated in 1887 with the approval of Pope Leo XIII. It includes graduate and undergraduate courses, and is organized in five faculties—theology, law, philosophy, letters, and science. The government rests with a self-perpetuating body of trustees chosen from bishops, clergy, and laity. The archbishop of Baltimore is the perpetual chancellor, exercising his administrative functions through a rector appointed every six years by the Holy See.

Affiliated with the University are St. Paul Seminary in St. Paul, Minn., and St. Paul College, the Marist College, Holy Cross College, the College of the Holy Land, St. Austin's College, College of the Immaculate Conception (Dominicans), the Oblates College, the Apostolic Mission House, Trinity College for Women, and the Catholic Sisters College, all in the District of Columbia. Summer schools are conducted in Washington and in Dubuque, Ia. In 1916 the University grounds covered 213 acres, and the property of the University was valued at $3,500,000. There were 75 teachers, and 554 students, of whom 144 were ecclesiastics; the library comprised 100,000 volumes.

Cathol'ikos, a title which seems to have been applied to the superintendent-general of missions, or of churches, on and beyond the borders of the Roman empire. It is also the title of certain dignitaries of the Armenian Church.

Cat'iline (CATILINA or CATALINA, LUCIUS SERGIUS), born about 108 B.C. He was in his youth a zealous supporter of Sulla. He was prætor in 68 B.C., and governed Africa the next year. In 63 B.C. he formed a conspiracy to secure the government, and is said to have plotted the murder of the consuls in 65 B.C., only failing by giving the signal too soon. In 63 the conspiracy assumed more dangerous proportions; but Cicero denounced (Oct. 21, 63) Catiline and drove him from Rome. His accomplices were betrayed and executed in the city; and he fell at the head of his disorderly forces at Pistoria in Etruria, in a battle against Antonius, Cicero's colleague in the consulship. He had courage and ability, but otherwise displayed the worst vices of the Roman character. Ibsen has idealized him in an early drama. Consult E. S. Beesly's *Catiline, Clodius, and Tiberius.*

Cat Island. See BAHAMAS.

Catkin (*amentum*). Although the vegetative growth of all inflorescences tends to be more or less shortened and compressed in consequence of their reproductive purpose, we have this peculiarly manifested in the catkin, which is a crowded spike or tuft of small unisexual flowers with reduced scale-like bracts. Examples are found in the willow, hazel, oak, birch, alder, etc. In some, as in the hazel and oak, the male flowers only are in catkins, the female catkin of the flower being reduced to a few brown scales, while the female flowers of the oak are solitary, each on its own branchlet.

Catlettsburg, city, Kentucky, county seat of Boyd county, on the Ohio River, and the Chesapeake and Ohio Railroad; 150 miles northeast of Frankfort. It has flour and saw mills, machine shops, and potteries. Pop. (1900) 3,081; (1910) 3,520.

Catlin, GEORGE (1796–1872), American painter and writer, was born at Wilkesbarre, Pa. He studied for the law, but soon turned to drawing and painting. In 1832 he went to the Far West to study the American Indians, and spent the next eight years among them, painting portraits of individuals (not less than 470 full length) and pictures illustrative of life and manners, most of which are now in the National Museum at Washington. In 1862–7 he travelled in South and Central America, and lived in Europe until 1871. His works include: *Manners, Customs, and Conditions of the North American Indians* (1841); *The North American Portfolio* (1844); *Notes of Eight Years in Europe* (1848); *Last Rambles Among the Rockies and Andes* (1868). Consult *George Catlin; My Life Among the Indians* (ed. by M. G. Humphreys, 1909).

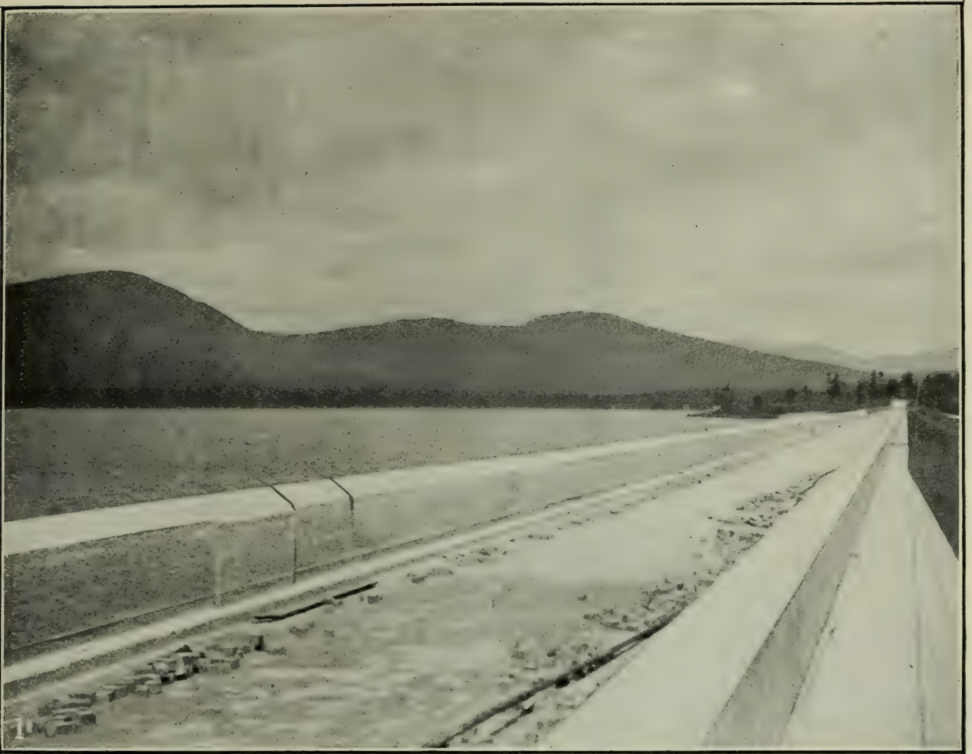
Catlinite, or pipestone, an indurated clay shale occurring as a narrow seam in the heavily bedded quartzites of Southwestern Minnesota.

Catmint, or CATNIP (*Nepeta*), a genus of hardy labiate plants with a five-toothed tubular calyx, a corolla tube longer than the calyx, and its two front stamens shorter than the others. *N. Cataria,* common in North America, has hoary foliage and is very aromatic; its flowers, produced in late summer, are white with purple dots, and are borne in dense axillary whorls. Its peculiar fragrance is attractive to cats.

Catnip. See CATMINT.

Ca'to, DIONYSIUS, is the name prefixed to a little volume of moral precepts in verse, which was a great favorite during the Middle Ages, but the author of which is unknown. Its usual title is *Dionysii Catonis Disticha de Moribus.* It begins with a preface addressed by the supposed author to his son, after which come fifty-six injunctions. Next follow 164 moral precepts in dactylic hexameters. The book was early translated into most of the Western languages. An English version was printed by Caxton.

Cato, MARCUS PORCIUS (234 B.C.–149 B.C.), frequently surnamed CENSORIUS or CENSOR, also SAPIENS ('the wise'), and afterward PRISCUS or MAJOR—to distinguish him from his great-grandson, Cato of Utica—was born at Tusculum, and was brought up on his father's farm in the Sabine country. He made his first campaign in his seventeenth year, distinguished himself at the capture of Tarentum (209), at the defeat of Hasdrubal on the Metaurus (207), and in the later years of the Second Punic War. At the same time he had been making himself a reputation as an orator and statesman. He became quæstor in 204, served under the pro-consul Scipio Africanus in Sicily and Africa, was ædile in 199, and prætor the following year, when he obtained Sardinia as his province. In 195 he was raised to the consulship. Spain fell to him as his province, and here he showed such vigor and military genius in crushing a formidable insurrection that in the following year he was honored by a triumph. In 191 he served in the campaign against Antiochus, and to him the great victory won at Thermopylæ was mainly due. He now turned himself strenuously to civil affairs, and strove with all his might to stem the tide of Greek refinement and luxury, and advocate a return to a simpler and stricter social life after the ancient Roman pattern. In 187 he opposed the granting of a triumph to M. Fulvius Nobilio after his return from Ætolia victorious, on the ground that he was too indulgent to his soldiers, that he cherished literary tastes, and even kept poets in his camp. These rude prejudices of Cato were not acceptable to the senate, and his opposition was fruitless. In 184 Cato was elected censor, and discharged so rigorously the duties of his office that the epithet *Censorius,* formerly applied to all persons in the same station, became his permanent surname. He repaired the watercourses, paved the reservoirs, cleansed the drains, raised the



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THE CATSKILL AQUEDUCT.

1. Driveway along the Crest of the Olive Bridge Dam, of the Ashokan Reservoir. This Dam is a Masonry Structure 190 Feet Thick at the Base, 220 Feet High, and 4,650 Feet Long; Contains 420,000 Cubic Yards of Cyclopean Masonry, 56,000 Yards of Concrete Blocks, and 2,000,000 Cubic Yards of Embankment. 2. Rye Outlet Bridge at Kensico, of Reinforced Concrete, 110 Feet Above the Bed of the Reservoir; 924 Feet Long, Including the Approaches.

rents paid by the publicans for the farming of the taxes, and diminished the contract prices paid by the state to the undertakers of public works. More questionable reforms were those in regard to the price of slaves, dress, furniture, equipage, and the like. Good and bad innovations he opposed with equal animosity and intolerance, and his despotism in enforcing his own idea of decency may be illustrated from the fact that he degraded Manilius, a man of prætorian rank, for having kissed his wife in his daughter's presence in open day.

In 175 B.C. he was sent as ambassador to Carthage, and was so impressed by the strength of that city that for the rest of his life, whatever question was before the senate, he always introduced the phrase, *Delenda est Carthago* ('Carthage must be destroyed'). Cato represents the Roman character in its extremest type, both of virtue and of vice: courageous, plain living, and patriotic, he was revengeful, arrogant, and even brutal to his inferiors. He wrote several works of which only the *De Re Rustica*, a collection of the rules of good husbandry, has come down to us. There exist a few fragments of his *Origines*, a summary of the Roman annals.

Cato, MARCUS PORCIUS (95 B.C.–46 B.C.), named CATO THE YOUNGER, or CATO UTICENSIS (from the place of his death), was educated in the house of his uncle, M. Livius Drusus. From Macedonia, where he was military tribune in 67, he went to Pergamus in search of the stoic philosopher Athenodorus. He brought him back to his camp, and induced him to proceed with him to Rome, where he spent the time partly in philosophical studies, and partly in forensic discussions. In 63 B. C., as tribune of the plebs, he strongly supported Cicero in the senate on the proposal that Catiline's fellow conspirators should be executed. Until the civil war between Cæsar and Pompey, Cato was an active supporter of the senatorial party; but after Pompey's defeat at Pharsalia (48 B.C.) he went to Africa, and joined Metellus Scipio, who was routed at Thapsus in 46 B.C. Utica held out; but Cato advised the townspeople to surrender for fear of provoking Cæsar's indignation. After spending a night in reading Plato's *Phædo*, he committed suicide by stabbing himself in the breast.

Catoche, Cape, kä-tō'chā, the northeast point of Yucatan, was the spot where the Spaniards first saw Mexico (1517).

Catop'trics. See DIOPTRICS.

Catorce, kä-tôr'thā, or ALAMOS DE CATORCE, town, San Luis Potosí state, Mexico; 108 miles north of San Luis Potosí. It is situated at the base of a high mountain, and has important silver and tin mines. Pop. 18,000.

Ca'to Street Conspiracy, a plot formed in London, England, in 1820 by certain revolutionary spirits for the murder of Lord Castlereagh and other ministers of the crown, so called from the place of meeting in Cato Street, Edgeware Road. The plot was revealed to the police by one of the gang. Arthur Thistlewood, the ringleader, and four others were hanged, while five more were transported for life.

Cats, JAKOB (1577–1660), Dutch poet, born at Brouwershaven (Zeeland). After filling civil appointments in Holland, he was sent in 1627 as ambassador to London; became, in 1648, minister of justice in Holland; and in 1651 was again ambassador in London. He is the author of several volumes of poetry, characterized by their easy style, which, with their familiar moral and didactic tone has made them immensely popular with his countrymen; in fact, the poems of 'Father Cats' were long associated with the Bible in popular favor. Among his best works are *Moral Emblems* (1618; Eng. trans.), *Selfstryt* (1620; Eng. trans.), *Houwelyk* (1625), and his most ambitious effort, *Trouring* (1653).

Cat's-eye, an ornamental stone used especially for rings. It is always cut *en cobochon;* and when light falls on the rounded surface, a narrow bright line of paler color is produced by reflection from numerous long parallel fibres which traverse the mineral. The resemblance to the narrow, elongated pupil of the eye of the cat is the source of the name.

There are two varieties of cat's-eye, the Occidental and the Oriental. The former is quartz enclosing fine fibres of asbestos; but often these have weathered out, leaving narrow tubules: the appearance, however, is not affected by this. (See CROCIDOLITE.) In quartz cat's-eye the color may be white, pale, or dark gray, yellow, brown, green, or sometimes blue. The Oriental is far more valuable, and among Eastern peoples is one of the most highly prized of gems. It is chrysoberyl, with similar fibrous enclosures, and is much more beautiful, with a far finer lustre. The most esteemed are those of a brown color, with a narrow and well-defined bluish line of light. Oriental cat's-eye is found principally in Ceylon, and is also known as cymophane. Occidental cat's-eye is found in Bavaria, Malabar (India), Ceylon, and many other localities.

Catskill, village, New York, county seat of Greene county, on the Hudson River, the West Shore Railroad, and Hudson River steamboat lines; 34 miles south of Albany by rail. Manufactures include woollens and hosiery, glass and bricks. It was settled about 1680. Pop. (1900) 5,484; (1910) 5,296.

Catskill Aqueduct, one of the greatest engineering feats ever accomplished, whereby 300,000,000 gallons of water are daily conveyed to New York City from the Catskill Mountains, a distance of over 100 miles, was authorized in 1905, and was to be placed in complete operation in April, 1917. The Aqueduct is 92 miles long, not including the great city tunnel over 17 miles long and various pipe-line extensions. Of the 92 miles, 55 are of concrete, near the surface, horseshoe shaped, 17 feet high and 17½ feet wide; 14 miles are concrete-lined grade tunnels, horseshoe shaped, 17 feet high, and 13½ feet wide; 17 miles are concrete-lined pressure tunnels, some 14 feet in diameter; and 6 miles are inverted siphons of riveted steel pipe, 9 and 11 feet in diameter, the plates being $\frac{7}{16}$ to ¾inch thick, lined with 2 inches of cement mortar and covered with concrete, the whole in earth embankment.

The Ashokan Reservoir, at the northern extremity of the Aqueduct, is located about 500 feet above sea level; it has an area of 13 square miles, and a capacity of 132,000,000,000 gallons. From this reservoir the Aqueduct runs close to the surface, except for short siphons under streams and short tunnels through hills, for a distance of 10 miles to Rondout Creek, beneath which there is a pressure tunnel 4½ miles long. Emerging at the surface, it cuts through a hill for a mile and a half, then follows the surface for about four miles, and passes beneath the Walkill River by a second pressure tunnel at a depth of from 350 to 480 feet. From this point it follows the surface for 17 miles, dips 650 feet under Moodna Creek, and continues at that depth to Storm King, on the west shore of the Hudson River. Here it descends 894 feet, passes under the river, and rises to 450 feet above sea level on the east shore. For 27 miles it continues along the surface, except for tunnels and siphons, to the Kensico storage reservoir. Sixteen miles farther on, just north of the New York City line, it reaches the Hill View equalizing reservoir.

The City Tunnel extension of the Catskill Aqueduct is in rock, concrete lined, 15 to 11 feet in diameter, 200 to 750 feet below the surface. It extends beneath the Harlem River, Manhattan Borough, the East River, and Brooklyn Borough. From the Brooklyn end of the City Tunnel pipes extend to the boroughs of Queens and Richmond (Staten Island), the Narrows being crossed by a submerged cast-iron pipe with flexible joints. Numerous concrete-lined uptake shafts, with special valves, connect the city tunnel with the distributing mains of the city. The Silver Lake terminal reservoir on Staten Island receives the flow of water which has not been used. The total cost of the project was nearly $150,000,000.

Eventually water will be drawn from the Schoharie, Rondout, and Catskill Creek watersheds, as well as from the Esopus; and the total supply available daily will be 750,000,000 gallons. Consult L. White's *The Catskill Water Supply of New York City* (1913).

Catskill Formation, so called because first studied in the Catskill Mountains, New York, denotes a series of sandstones and shales of Upper Devonian age, seen on the northern slopes of the Appalachian Mountains. They are shallow-water deposits, formed during the time when the marine sediments of the Hamilton, Portage, and Chemung groups were being laid down in deeper waters. Their colors are usually red, brown, greenish, and steel gray, and the sandstone often splits into thin horizontal layers, which are quarried for flagstones. Fossils are not common in this group, which bears the same relation to the marine Devonian of Eastern North America as the Old Red Sandstone (q. v.) does to the marine formations of Great Britain.

Catskill Mountains, a group of mountains comprised in the Appalachian system, situated in Greene and Ulster counties, New York, with minor ramifications extending into Delaware and Schoharie counties. They cover an area of about 500 square miles, with a general trend from southeast to northwest. On the west they are practically continuous with a high plateau of Western New York; on the east, for a distance of about 12 miles, they approach to within 8 miles of the Hudson River, then descend abruptly from heights of 2,000 and 3,000 feet into the plain below. Among the loftiest summits are Slide Mountain, 4,205 feet; Hunter, 4,025 feet; Black Dome, 3,990 feet; Black Head, 3,937 feet; Doubletop, 3,905 feet; Peekamoose, 3,863 feet; Panther Mountain, 3,760 feet; High Peak, 3,660 feet; and Indian Head, 3,585 feet.

The Catskill Mountains consist of Devonian sandstones and shales. They are well timbered with hardwood forests, and the scenery, diversified by precipices, ravines ('cloves'), streams, and waterfalls, is very picturesque. They contain some of the best situated and most popular resorts in the country. Kingston and Catskill, connected by steamer with New York, are the principal points of access to the region. Consult *Bulletin* of American Geographical Society, Vol. xxxix., No. 4 (1907); John Burroughs' *In the Catskills* (1910).

Catt, Carrie Chapman Lane, American leader of woman suffrage, was born in Ripon, Wis. She was educated in the State Industrial College of Iowa, studied law, and became principal of the high school and general superintendent of schools in Mason City, Ia. She has been active in the cause of woman suffrage since 1890, lecturing extensively in the United States, Europe, and many other lands. She organized the International Woman Suffrage Alliance, of which she has been president since 1904, and in 1916 became president for the second time of the National American Woman's Suffrage Association. She has been twice married, to Leo Chapman (1884), and after his death to George W. Catt (1890).

Cat Tail. See Bulrush.

Cattaro, kät′tä-rō (Slavonic *Kotor*), seaport, Dalmatia, Austria; 35 miles southeast of Ragusa. It stands at the head of the Bocche di Cattaro, and is strongly fortified. The town gives name to a Roman Catholic see and an Orthodox Greek see. Originally a small independent state, Cattaro joined herself to Venice in 1420, and shared her fortunes down to 1797; in 1814 she passed under the rule of Austria. The town was almost destroyed by earthquake in 1563, and again in 1667. Pop. (1911) 6,041.

Cattaro, Gulf of, or Bocche di Cattaro, a spacious inlet of the Dalmatian coast, Austria, affording deep water close up to the shore, and dividing into four larger and several smaller basins. It is 19 miles long.

Cattegat. See Kattegat.

Cattell′, James McKeen (1860), American psychologist, was born in Easton, Pa., and was graduated from Lafayette College (1880), continuing his studies at Göttingen, Paris, Geneva, Johns Hopkins, and Leipzig (1880–6). He was a lecturer at Cambridge University (1888), and was professor of psychology at the University of Pennsylvania from 1888 to 1891, when he was called to the chair of experimental psychology at Columbia, becoming professor of psychology at that institution in 1896, where he has served as head of the departments of anthropology (1896–1902), and of philosophy (1902–05). He was editor of *Science, The Psychological Review, The Popular Science Monthly*, and *American Men of Science: a Biographical Directory* (1906; new ed. 1910).

Cattell, William Cassidy (1827–98), American educator, was born in Salem, N. J., and was graduated from Princeton (1848) and Princeton Theological Seminary (1852). He was professor of Latin and Greek at Lafayette College in 1855–60; pastor of the Pine Street Presbyterian Church, Harrisburg, Pa., in 1860–63; and president of Lafayette College from 1863 to 1883. During his presidency he was instrumental in obtaining $1,000,000 for the college, and its buildings and equipment were greatly improved.

Cat′termole, George (1800–68), English water color painter and book illustrator, born at Dickleborough, Norfolk. Having executed drawings for Britton's *English Cathedrals* in 1816, he exhibited in the Royal Academy (1819–27), and in 1833 became a member of the Society of Painters in Water Colors. He illustrated the *Waverley Novels* (1830), *Master Humphrey's Clock* (1840–1), and other works. He was distinguished by great versatility, and by considerable power of grouping and composition.

Catti, kat′ī, or Chatti, tribe of ancient Germany, inhabiting parts of modern Westphalia, Nassau, Hesse-Darmstadt, and Hesse-Kassel. They were never subdued by the Romans.

Cattle. Although sometimes used in a broader sense to include horned stock, horses, and sheep, the word 'cattle' is properly applied to bovine animals belonging to the species *Bos taurus*—the domestic cow, ox, and steer. The exact origin of cattle has not been definitely known, but has been generally assigned to two wild species. Darwin concluded that European cattle were descended from *Bos primigenius* and *B. longifrons*. In recent writings, Lydekker refers all cattle to the aurochs, *Bos primigenius* or *B. urus*, eliminating *B. longifrons*. The aurochs he holds to be a descendant of *B. planifrons*, which was a polled or hornless animal and became extinct in geological times. He considers all the British park cattle, such as the Chillingham cattle, Charteley, Cadzow, etc., to be stunted descendants of the aurochs. These cattle are in a semi-wild condition, being difficult to approach, and preserve many of their wild instincts, such as the habit of hiding their calves. They are smaller than ordinary cattle, of white or light gray color, and have black muzzles and feet, although red or black calves are occasionally dropped by them.

Zoologically, cattle are related to the bisons of Europe and the American plains, buffaloes, yaks, the musk ox, and the zebu, and with them form the Bovidæ, or ox division of the Ruminantia. Economically, they are perhaps the most useful of the domesticated animals. Their flesh is part of the daily food of man—butter, cheese, and milk are on every table; their hides go to make leather; their hair forms part of plaster; their hoofs are used for glue; their bones for fertilizer, ornaments, and buttons, and many other purposes.

Cattle have been domesticated in Europe and Asia from prehistoric times, and are mentioned in writings at least 4,000 years old, the indications being that different types were known at that date. The tendency toward variation early made itself apparent, and this with the influences of environment, notably climate and food, resulted in a variety of types. These factors were taken account of by the ancients, although there are no indications that they reached any very high degree of development. The selection and crossing of individuals, with reference to securing a definite type or set of characteristics, has been the most potent factor in improving cattle and developing distinct breeds. The improvement of cattle in the modern sense commenced only in the middle of the eighteenth century. Bakewell undertook the improvement of the British Longhorns, and was followed by the Culleys, the brothers Colling, the Booths, and Bates, who undertook a similar task for the Shorthorns of the Northern counties. At that time it was thought impossible to fatten an ox under four or even five years old, but by increased care and skill, combined with intelligent selection, it became possible to fatten them at the age of two years.

The principal objects aimed at by the great breeders of the latter end of the eighteenth century were: (1) early maturity, (2) utility of form, (3) beauty of form, (4) uniformity of type, (5) aptitude to fatten, and (6) strength of constitution. To guard against reversion or breeding back to unworthy ancestors, cattle were selected whose pedigrees were known, and no animals were used that were not purely bred. The difficulty of procuring suitable sires caused the same bull to be mated with females closely related to him, and some of the most famous sires were used for three or four generations in the same herd. This system of 'in-and-in' breeding proved less injurious than might have been expected. The longer the pedigree the more reliable was the result—that is, if the successive sires and females used in building it up were all of the requisite merit and purity of blood. This system of careful breeding was accompanied with rigorous weeding out of all inferior animals.

With the establishment of certain principles of breeding, other lines of improvement were undertaken, such as increased milk yield, improvement of the quality of the milk, and prolongation of the period of milk flow. The results in these lines have been no less remarkable than in the development of early maturity and beef-producing qualities. This specialization has proceeded so far that in the United States two general classes of cattle are recognized, beef cattle and dairy cattle, although between the extremes of these two groups certain breeds are recognized as dual-purpose animals, with the beef and the milking qualities both developed to considerable degree. With a single exception the breeds in the United States have been introduced from Europe, and mainly from Great Britain, although of late much attention has been given in this country to breeding for improvement. In the United States and Canada cattle are classified as (1) pure bred, whose lineage is kept in public records; (2) grades or common cattle of mixed breeding, but usually possessed of some pure blood; and (3) scrubs or unimproved stock.

Beef Cattle.—The best type of beef cattle is squarely and compactly built, full and broad over the back and loins, possessing depth and quality particularly in these regions. The hips are evenly fleshed, the legs full and thick, the under line parallel with the straight back. The neck is full and short. The eye should be bright, the face short, the bones of fine texture, the skin soft and pliable, and the flesh mellow, elastic to the touch, and rich in quality. The muzzle should be broad and strong, indicating superior feeding capacity, and the forehead broad and full.

Breeds of Beef Cattle.—The principal breeds among beef cattle in America are the Aberdeen-Angus, Galloway, Hereford and Shorthorn or Durham. The *Aberdeen-Angus*, sometimes called the Polled Angus, is a black, hornless breed of Scotch origin of pronounced beef qualities. These cattle are compactly built; the body is well rounded and of relatively great depth, the legs are short, the head is short and wide, the chest wide and deep, and the back broad and straight. The bulls attain a weight of 2,200 pounds and the cows of 1,400 pounds. A high percentage (up to 65 per cent.) of meat, fine-grained and of excellent quality, is produced. The Aberdeen-Angus was introduced into the United States in 1873 and met with great favor, especially in the West and Middle West. It is bred also in Canada, the British Isles, France, Denmark, Germany, New Zealand, South America, and the Sandwich Islands.

The *Galloway* is also a black, hornless breed, originating in Scotland and bearing a general resemblance to the Aberdeen-Angus. The animals are smaller than the latter, shorter legged, and have a longer, more shaggy coat, which is beautifully waved. Their natural environment has made them an especially hardy breed, of excellent grazing qualities, but their milking qualities are undeveloped, and, as a rule, they do not mature as quickly as some other beef breeds. Their meat is excellent and their breeding qualities are high. Galloway cattle were brought to America at an early date, and are raised especially in the Far West and the Canadian Northwest.

Hereford cattle are descended from the aboriginal breed of Great Britain. Distinguishing characteristics are the white face; red body broken with white on the breast, belly, legs, and crest and tip of the tail; large, rectangular, compact body; soft hair, often curled; and fairly widespreading horns. The legs are short and placed well under the body. Herefords are among the heaviest cattle, the males often weighing as much as 2,200 pounds and the females 1,500 pounds. They mature early, take on flesh rapidly on good pasture, and yield meat of excellent quality, the proportion of dressed meat to live weight being relatively large. They are poor milkers often furnishing insufficient milk for their calves. The breed has many admirers in the show ring, among stock raisers, and among butchers, and is one of the best of the exclusively beef cattle. It was introduced into America in 1817, and is popular in the West and Southwest and in New England. It has met with success also in Canada, Australia, New Zealand, and the Argentine. A breed of *Polled Herefords* has recently been established, the absence of horns commending them to stockmen.

The most popular and the most widely distributed of the breeds of beef cattle are the *Shorthorns* or *Durhams*, which originated in Northeastern England and have been continuously improved by breeders, starting with Charles and Robert Colling (1780), Thomas Bates, Richard Booth, Amos Cruikshank, and others. They were imported into America between 1783 and 1795, and have been exported to nearly every country colonized by Anglo-Saxons, being numerous in Australia, New Zealand and Argentina, as well as in Great Britain, United States and Canada. They are a large breed in size and weight (cows 1,400 lbs.; bulls 1,800 to 2,200 lbs.), of a red, red and white, or roan color, with occasionally an all-white specimen, and compactly built, with rectangular bodies, lean, shapely heads, small short horns, and short legs. They are unsurpassed in earliness of maturity, are excellent feeders, furnish tender, juicy meat, and dress well, the proportion of bone and offal being relatively small. They are generally possessed of good milking qualities, and some families have this developed to such an extent as to class them among dual-purpose or even dairy animals.

The *Devons* are sometimes classed with the beef breeds and sometimes as dual-purpose animals, suited to both beef and milk production. They were formerly prized as draft animals, some of the finest oxen being of that breed, large, and of a rich red color. The breed is one of the most ancient and pure of the distinct British breeds.

Raising Cattle for Beef.—Profitable beef production depends upon the selection of a suitable cow herd and the use of a good pure-bred bull, so managed that each generation of cows is an improvement upon the preceding one. Healthy cows of strong constitution and good quality, which do well on limited feed rations, as indicated by uniform fleshing, loose, pliable skin, and glossy coat, should be selected for the breeding herd. During the summer months the cows should be maintained largely on pasture, supplemented, when necessary, by silage or forage crops. In the early fall they may be maintained on meadows and aftermath, and later on stalk fields. Winter rations vary in different sections. Cows raised solely for breeding purposes may be fed on silage and dry roughages combined with a small quantity of protein-rich concentrates. Cows kept also for dairy purposes should be fed after the manner of dairy cattle (see *below*). The following rations for wintering cows in various sections of the United States are taken from *Farmer's Bulletin* 1073 (U. S. Department of Agriculture), which has been largely used in the preparation of this article.

Far West or Coast Section.

I.

Oat or barley hay	10 lbs.
Corn silage	30 lbs.
Barley	2 lbs.

II.

Corn silage	40 lbs.
Alfalfa hay	5 lbs.
Straw	unlimited

III.

Alfalfa hay	10 lbs.
Cereal straw	15 lbs.
Barley	1 lb.

IV.

Sugar beet pulp	40 lbs.
Alfalfa hay	5 lbs.
Corn stover or cereal hay	10 lbs.

V.

Alfalfa hay	5 lbs.
Oat or barley hay	20 lbs.
Straw	unlimited

VI.

Mixed or grass hay	15 lbs.
Alfalfa or clover hay	5 lbs.
Barley	2 lbs.

North Central, or Corn Belt Section and East or Atlantic Coast Section.

I.

Corn silage	35 lbs.
Corn stover	10 lbs.
Cottonseed meal or oil meal	1 lb.

II.

Alfalfa or clover	10 lbs.
Corn stover or straw	15 lbs.

III.

Corn silage	40 lbs.
Straw	5 lbs.
Oil meal or gluten feed	¾ lb.

IV

Corn silage	35 lbs.
Clover hay	10 lbs.

Southeast, or Cotton Section.

I.

Corn silage	35 lbs.
Cottonseed hulls or straw	10 lbs.
Cottonseed meal	1½ lbs.

II.

Corn stover, coarse hay or straw	unlimited
Cottonseed cake	2 lbs.

III.

Alfalfa	5 lbs.
Corn silage or Sorghum silage	40 lbs

IV.

Sorghum silage	40 lbs.
Velvet beans (seed or pod)	2 lbs.
Lespedeza hay, or peanut-vine hay.	5 lbs.

V.

Grass hay	15 lbs.
Velvet beans (seed or pod)	4 lbs.
Straw or stover	5 lbs.

VI.

Velvet-bean and cornstalk fields

Special attention should be paid to the care and feeding of the bull. He should be kept in a separate paddock or lot and should be well fed the year around, but especially so just prior to the breeding season. His ration may consist mainly of roughage, with a small quantity of grain.

The breeding herd may be so managed that either spring or fall calves are raised. The period of gestation is 283 days. If the cows are in a vigorous, healthy condition at the time of calving they will need little assistance. The newborn calf should have the fetal membrane removed from its nose and mouth at once, and it may be necessary to pull the tongue slightly and to exert some pressure on the ribs to stimulate respiration. The average weight at birth is 66 to 92 pounds.

If the cattle are raised solely for beef production, the calves are allowed to run with their dams until weaned. For straight beef production only a small quantity of feed is needed in addition to the mother's milk, but the young calves should be taught to eat grain and hay to prevent loss of flesh at the time of weaning. Calves intended for 'baby beef,' that is calves ready for market at the age of sixteen to twenty months, should be started on grain when from four to six weeks old. Equal parts by weight, of shelled corn, whole oats, and wheat bran may be used, and the grain allowance should be increased gradually up to the time of weaning. If the herd is depended upon for milk as well as for beef production, the cows are milked and the calves are raised on skimmed milk and supplemental feeds, the latter being increased gradually until the calf can do without milk when from six to eight months old. Spring calves should be weaned before the end of the pasture season in the fall to allow them some time on grass if winter pasture cannot be provided. Fall calves should be weaned after being placed on pasture the following spring. All calves should be dehorned and the males castrated before weaning.

After weaning, beef calves should be fed on whole oats or whole corn, a little oil meal (cottonseed or linseed), and plenty of legume hays. Grass is unequalled as a flesh builder, and in winter should be approximated by silage or roots. Calves intended for mature beef may be sold as 'stockers or feeders,' that is, to be fed further before slaughtering, or may be fattened on the farm.

Great progress has been made in the United States in the improvement of the cattle raised and fed for beef, by developing earlier maturity, ability to fatten well and give good return for the feed, and better dressing qualities on the block, with a larger proportion of better cuts of meat and less offal. In developing these more profitable cattle the pure-bred beef breeds have been crossed with the native stock, and the improvement has spread from the pastures of the Middle West to the range. The large stock yards recognize five definite market classes of beef cattle: (1) 'Beef Cattle,' including fattened steers suited to dressed beef, export, and shipping, and graded as prime, choice, good, medium, and common rough steers, baby beef, Texas, and Western Range cattle; (2) 'Butcher Stock,' including the better grades of heifers, cows, and bulls, and common or inferior steers which have failed to fatten satisfactorily; (3) 'Cutters and Canners,' composed of thin cows and bulls, and inferior steers and heifers—in fact, anything of a low, inferior grade; (4) 'Stockers and Feeders;' and (5) 'Veal Calves.' All but the fourth class are slaughtering stock, and each class is divided into several grades recognized in buying and in the market quotations.

Dairy Cattle.—In general appearance the dairy cow shows certain marked characteristics which serve at once to distinguish it from the beef stock. The body tends to be wedge-shaped rather than rectangular, the head is narrow and long, and the distance between the eyes is great. The neck should be long and thin; the shoulders thin and lithe, and narrow at the top; the back open, angular, and tapering toward the tail; the hips wide apart and covered with little meat. The good dairy cow is also thin in the region of the thigh and flank, but deep through the stomach girth, as a result of the long open ribs. The udder is large, attached well forward on the abdomen, and high up behind. It should be full but not fleshy. The lacteal or milk veins ought also to be large, and extend considerably toward the front legs.

Breeds of Dairy Cattle.—The leading dairy breeds in the United States are the Ayrshire, Guernsey, Jersey, Holstein-Friesian, Dutch Belted, and Red Polled. To this list must be added the Shorthorns, described under beef cattle, among which, as there stated, are some excellent milking strains. The breed has been represented in some of the largest competitive breed tests, and has made an excellent showing.

Ayrshires, named for the county of Ayr, in Scotland, where the breed originated, are of medium size (bulls 1,400 to 1,800 lbs; cows 900 to 1,100 lbs.), red and white spotted, short-legged, fine boned and of sprightly appearance. They are believed to be of mixed ancestry, made up largely of the blood of the Holderness, Dutch, Alderney, Kerry and West Highland breeds engrafted upon the native stock. The cows have excellent grazing qualities, doing well on a wide range of scanty pasture or upon coarse forage, but respond promptly and profitably to liberal feeding. Ayreshires are large and persistent milkers. A yield of 5,500 lbs. a year, as an average for a working herd in good hands, is often realized. While not exceptionally rich, the milk is somewhat above the average, the percentage of butter fat being between 3½ and 4 per cent.

The Guernseys and Jerseys are Channel Island breeds, the parent stock of which was derived to considerable extent from Normandy, and were long known in this country as Alderney cattle. While the origin of the two breeds is practically the same, more of the characteristics of the parent stock of Normandy have been retained in the *Guernseys.* They are rather larger than the Jerseys, stronger boned and coarser. They are light in color, yellow predominating, often with large patches of white on the body and legs. Darker shades, approaching brown, are found on some cows and are quite common on bulls. The skin is of a rich yellow color, suggesting richness of milk, which in fact has a higher color at all seasons than that of any other breed. The horns are white or amber. Guernsey cows give a liberal milk yield, and the milk is uncommonly rich in fat (4.68 per cent.) being especially well suited to butter production. They have great power of assimilating food and converting it into milk, although they will not generally bear much forcing. They are held by some to be hardier than the Jerseys, and heavier milkers, but both of these points are stoutly disputed. Guernsey cattle are raised chiefly on their native island of Guernsey, and in England, the United States (New England, New York, Pennsylvania, New Jersey, Wisconsin) and Canada.

Jersey cattle have exceeded the Guernseys in popularity in America, as judged by their number and distribution, and are unquestionably the most popular dairy cattle in the country, probably outnumbering all the other dairy breeds combined, excluding the Holsteins. The Jersey is small (cows 850 lbs.) and deer-like in form, lean and muscular, intelligent and gentle in disposition, with a handsome head and large, bright eyes set wide apart. The color varies from creamy white to fawn, tan, mouse-color, and all shades of brown to deep black. With all these colors there is usually considerable white, distributed in large patches. The milk is exceptionally rich (5.61 per cent. butter fat) and of a deep golden color, and the yield is often large. At home the Jersey has been bred for butter without regard to the amount of milk, but in the United States an attempt has been made to increase the yield of milk, with much success. The cows are noted for persistence in milking, making a long season of profit, with great evenness of product until near the close of lactation. Some remarkable records have been made by individuals and by entire herds. Several herd records show average yields of 6,000 and 7,000 lbs. per cow in a year, and there are records of single animals producing 9,000 to 12,000 lbs. per year, and at least two cows 17,000 lbs. of milk. Jersey butter records are correspondingly large, running as high as 600 to 800 and even 1,000 lbs. in a year. Good herds can be depended upon to produce 350 to 400 lbs. of butter per cow. Jerseys are heavy feeders, and have great capacity for assimilating feed, and using it profitably in milk production. They do not fatten readily, but are essentially machines for elaborating rich milk. Jersey cattle are widely distributed, being adaptable to varying conditions of climate and environment.

The *Holstein-Friesians*, commonly called *Holsteins*, are second only to the Jerseys in popularity in the United States, where they were introduced by the early Dutch colonists of New York. They are black and white cattle, from North Holland and Friesland, the exact origin of which is not definitely known, although the breed is one of the very oldest of the dairy breeds. The animals of both sexes are large sized—the largest of the dairy breeds, which, with their black and white markings, gives them a striking appearance. The black and white are never mixed, and are quite irregularly distributed. The cattle have great constitutional vigor, mature early, are heavy feeders, and produce a large quantity of milk of rather low fat content. Cows giving 40 to 60 lbs. of milk a day are regarded as average animals, and an average of 7,500 to 9,000 lbs. a year is expected from a good herd. There are numerous records of 100 lbs. a day for several days in succession, and of 20,000 to 30,000 lbs. a year.

The world's record production is that of the Holstein Segis Pieterje Prospect, 37,381.4 lbs. of milk and 1,448.68 lbs. of butter in 365 days. The milk of the large producers is usually low in total solids and deficient in fat. The breed has been popular for producing milk for city supply, and has been regarded as especially adapted to cheese making. Some families give milk of fully average richness, and have shown themselves to be profitable butter producers. The average butter fat content is 3 to 4 per cent.; the fat globules are small, the cream rises slowly, and has little color. Holstein-Friesians are bred in Belgium, Northern Germany, and Russia, as well as in Holland and America (East and Middle West).

Photo from "Wide World" Photos.

World's Record Holstein: Segis Pieterje Prospect of the Carnation Stock Farms.

This cow has broken all records by producing 37,381.4 pounds of milk and 1,448.68 pounds of butter in 365 days, or 4,000 pounds greater than the previous world record.

Dutch Belted cattle are black and white cattle from Holland, the white being in the form of a belt around the centre of the body. The belt varies in width, but rarely reaches as far forward as the shoulders or back to the hips. They are heavy milkers, although they do not equal the Holsteins, and their milk is of only average richness. They have never come greatly into favor in America.

Other dairy breeds which may be mentioned are the hardy French Canadian, somewhat resembling the Jersey breed, natives of Quebec, where they are chiefly raised, and the Kerry, from Western Ireland, a small hardy breed not widely distributed.

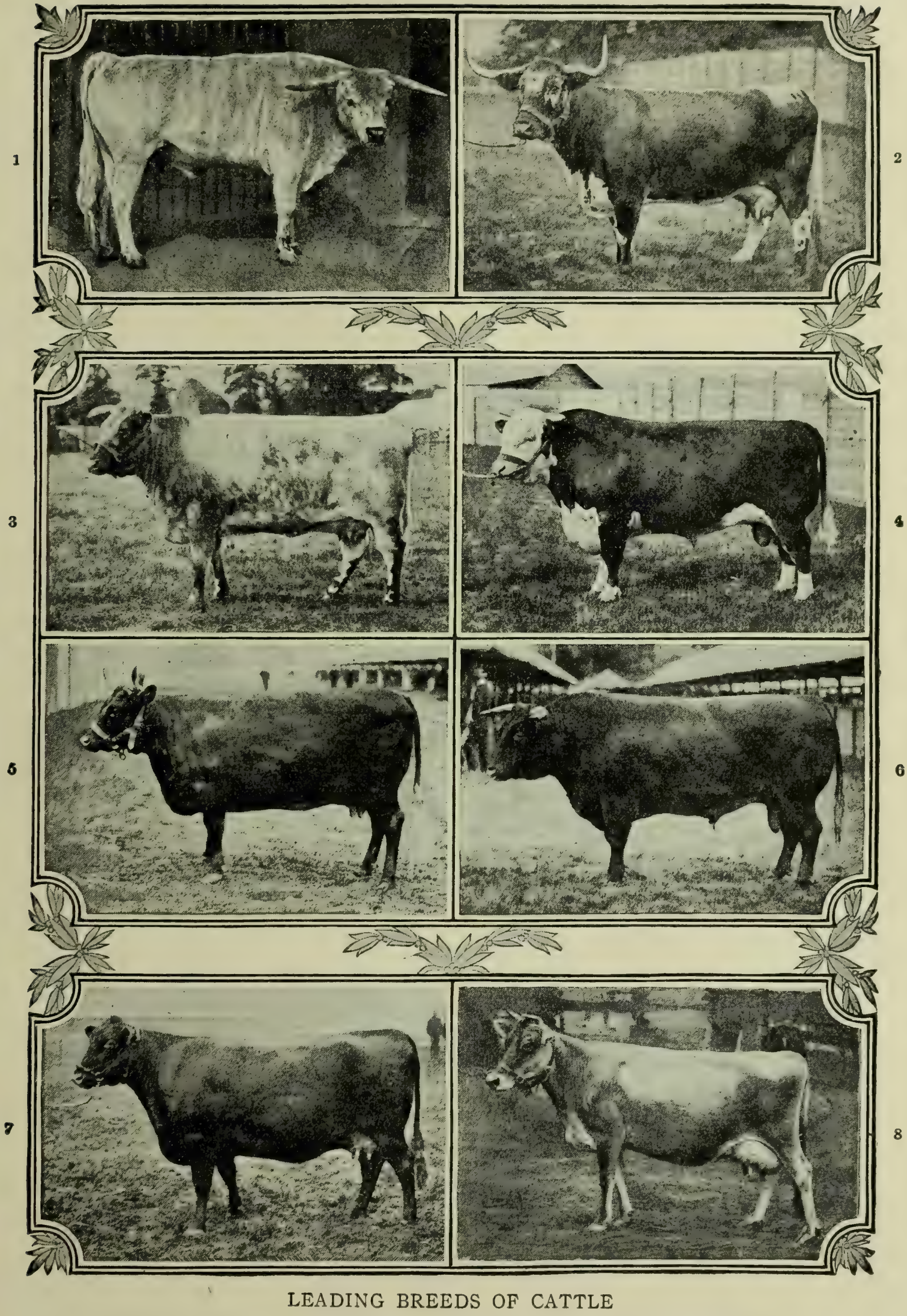
Raising Dairy Cattle.—In raising dairy cattle good healthy cows, showing the best characteristics of their class and with a milk-production record of 6,000 pounds or more, should be bred to the best pure-bred bull that can be obtained. The cows may be pastured during the grazing season and stabled during the winter months; the soiling system may be employed, by which they are kept more or less closely confined throughout the year and furnished with green crops; or a combination of the two systems may be used, pasturage being supplemented by silage in the late summer. A grain ration is also desirable, and an abundance of pure water if the cows are to be in good condition for parturition and heavy milking.

Regular and abundant feeding are essential to profitable dairying. In the summer, unless the soiling system is used, the main dependence may be placed on pasturage, supplemented during the later months by summer silage or, where that is unavailable, by grain. In the winter silage (especially corn), hay, and concentrates in the form of grains, and oil meals should be used. An ideal ration, according to one authority, consists of corn silage, 40 lbs.; clover hay, 15 lbs.; ground corn, 3 lbs.; cottonseed meal, 1 lb. See also DAIRYING.

The bull should be fed liberally on ground oats, wheat bran, gluten meal, oil meal, silage and clover hay and should have sufficient exercise to keep him in a vigorous condition.

The young heifers should be fed on skimmed milk, early supplemented by meal and hay or grass. They are ready to be bred at approximately twenty-one months so that the first calves are dropped at the age of two years and a half. The lactation period following is a fair indication of the milking qualities of the cow. The yield of milk generally increases up to the seventh year, remains stationary from the seventh to the tenth or twelfth year, and then declines.

In the improvement of cattle for dairy purposes the chief points aimed at have been early maturity, the lengthening of the period of lactation, economical use of the feed, and good return for it in the yield and richness of milk. In all of these respects very remarkable changes have been effected, and some highly developed types have been produced. The improvement is still going on within the breeds and among the grade animals, the dairymen now realizing the importance of selecting their cows with reference to economy of production, and that many cows have been kept at a positive loss. This selection and weeding-out process has been greatly promoted by the perfection of the



LEADING BREEDS OF CATTLE

1. British Wild Bull. 2. Longhorn Cow. 3. Shorthorn. 4. Hereford. 5. Devon Cow.
6. Sussex. 7. Red-polled Cow. 8. Native Jersey.

Babcock test (see MILK) for the fat content—a simple test which the ordinary dairyman can use and which requires little time. This, with the extension of the practice of keeping records of the individual cows, has placed milk production on a strictly business basis; but, unfortunately, there are still very many farmers and dairymen who know little of the relative productiveness of the individuals of their herd—this despite the fact that milk is now almost universally paid for at creameries and cheese factories on the basis of its fat content, *i.e.* the pounds of fat furnished during the month rather than the quantity of milk delivered.

It was formerly believed that certain breeds were especially adapted to butter production and others to cheese production, and this contention was stoutly maintained by the exponents of breeds of large milk yield but rather low fat content, it being held that the casein and not the fat was the controlling factor. The great breed tests carried on at Chicago, Buffalo, St. Louis and other places in connection with international expositions, together with the extensive work of the agricultural experiment stations, have largely done away with this notion. It is found that the fat is, after all, the important factor, as there is a fairly constant relation between it and the casein, and that by proper methods of manufacture the yield of cheese will bear a direct relation to the fat content of the milk. In other words, a good butter cow is also a good cheese cow.

Dual-purpose or general purpose cattle, as the name implies, combine beef-producing and milk-producing qualities. They are more massively built than dairy cattle, but lack the breadth and smoothness of the purely beef cattle. There are three breeds of importance in America: Brown Swiss, Polled Durhams, and Red Polled.

The *Brown Swiss*, as its name indicates, had its origin in Switzerland. It is the best known of the Swiss breeds in the United States. It is regarded by some authorities as a distinctly dairy breed, although it is rather fleshy. It is medium in size (cows 1,300 to 1,400 lbs.) small boned, and has a fine, silky coat, varying in color from a mouse-color and brownish dun to darker shades, with the head, neck, legs and quarters nearly black. The cows give a good flow of milk, which holds out well, and is well up to the medium in quality (3.3 per cent. butter fat). This is probably the most popular of the continental breeds in Europe, and is rapidly coming into favor in the United States and Canada on account of its merits.

The *Polled Durham* breed originated in the United States more especially in Ohio, the Shorthorns being the basis. The animals resemble the Shorthorns in size, color, and general appearance, but are hornless. They are often classed among the beef breeds, but many of them have considerable dairy excellence. In this respect they practically duplicate the 'milking Shorthorns.'

The *Red Polled* is a comparatively new breed, originating in the counties of Norfolk and Suffolk, England. These animals resemble the Devons almost as closely as the Polled Durhams resemble the Shorthorns, yet the two breeds are probably not closely related. They stand well up toward the head in popularity among the dual-purpose breeds in the United States. They rank well both as beef producers and as milkers. A yield of 5,000 pounds of milk a year is not uncommon; the percentage of butter fat is about 3.8.

Cattle Breeding Associations.—All of the above breeds of cattle are represented in this country by associations which register thoroughbred animals and issue herdbooks, in addition to promoting the general interests of the breed. See BREEDING.

Diseases of Cattle.—Cattle are subject to a large number of diseases attacking the respiratory, digestive, and generative organs. Only the most important of these can be touched upon in this work.

Bovine Tuberculosis.—One of the most important of the bacterial diseases of cattle, both from the point of view of the farmer and breeder and of the general public, is tuberculosis. The farmer may lose some of his herd by death, while others, though appearing quite well, may prove, when slaughtered, to be so badly infected as to be unfit for food. The chief danger to the community at large is of infection through milk, from infected cattle, which may contain the disease germs in enormous numbers.

Bovine tuberculosis is an infectious disease, caused by the tubercle bacillus, and characterized by the formation of tubercles or nodules—small grayish-yellow bodies, which may exist in almost every organ, and give rise to numerous disease processes which vary according to their situation. Its occurrence is favored by poor ventilation, overcrowding, insufficient air space, and all conditions hostile to general health.

The causative organism is contained in the oral and nasal discharges and in the excreta. These dry, and small particles are disseminated through the air, which is then inhaled by healthy animals, the germs thus finding their way into the throat, lungs, lymph glands, and general circulation.

The clinical symptoms of bovine tuberculosis are, generally speaking, unreliable, and diseased cattle may show practically no evidences of infection. As the disease progresses, however, the animal may lose flesh, the coat may become rough, and the eyes dull. Coughing may occur if the lungs are affected, and enlarged lymphatic glands may be detected. The tuberculous process may be localized in a single organ or generalized throughout the system. It is revealed post-mortem by the presence of the nodules or tubercles already mentioned.

'Tuberculin,' a glycerine extract from pure cultures of tubercle bacilli, is the most reliable diagnostic agent. Injected subcutaneously, it produces a distinct rise of temperature in tuberculous animals, while in cattle free from tuberculosis it produces no effects.

For the eradication of tuberculosis from a herd, the Danish method initiated by Professor Bang appears the most feasible. It consists briefly of (1) testing all cattle with tuberculin; (2) isolation of all reacting animals; (3) separation of calves from diseased cows at birth, and feeding them on boiled milk, so that they may grow up free from infection. Preventive measures include the provision of an open-air life for cattle wherever possible, ample ventilation, and good sanitary conditions in cowsheds. Prophylactic vaccination has had encouraging results, although the duration and the degree of immunity conferred are limited.

Foot-and-mouth disease (*Aphtha epizootica*) is an acute infectious disease which attacks all ruminating animals, though horses and dogs less readily, and occurs also in man. Germany, France, and other European countries have frequently been ravaged by it, but outbreaks in the United States have been quickly suppressed. It is due to a virus which exists in the saliva, the respired air, and in all the secretions and discharges of the body, and spreads rapidly. One attack does not confer immunity from another, so that the same animal may be attacked repeatedly at short intervals. The average period of incubation is from three to five days.

The mortality is one per cent. or less in the mild ordinary form

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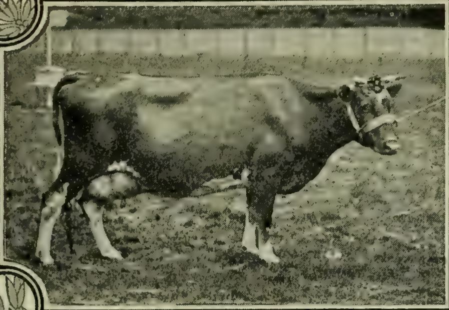

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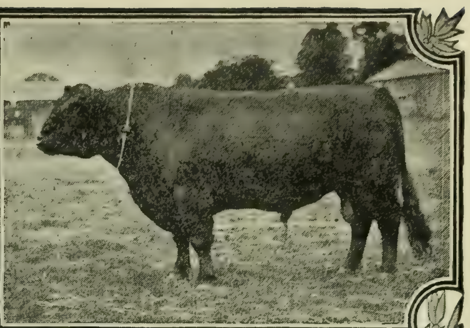

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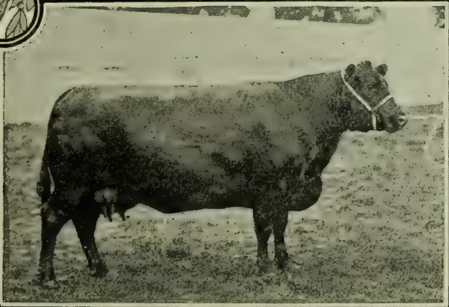

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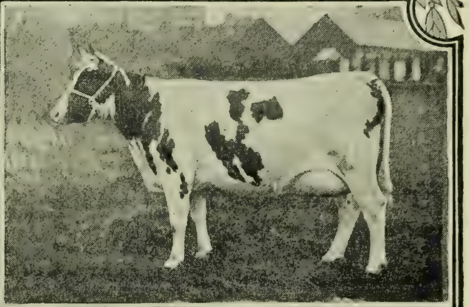

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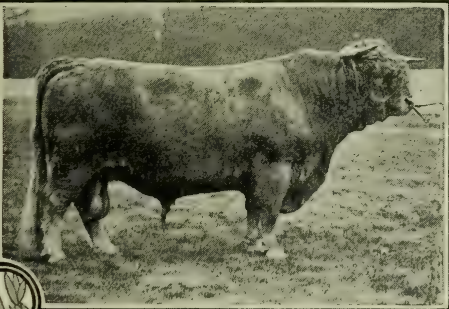

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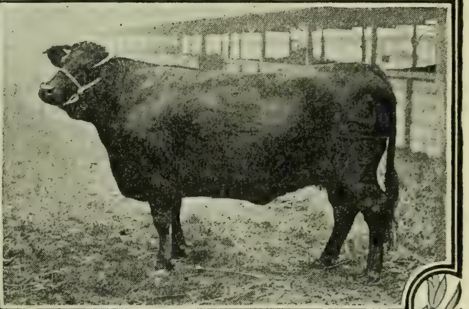

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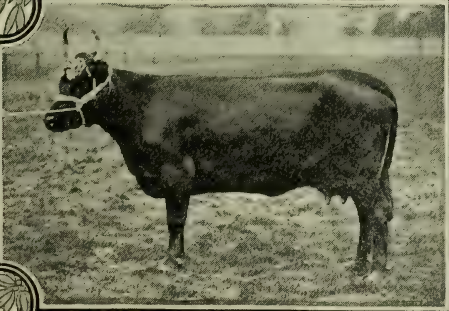

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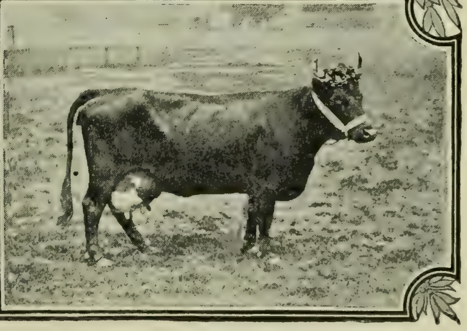


LEADING BREEDS OF CATTLE

9. Guernsey Cow. 10. Galloway Bull. 11. Aberdeen Angus. 12. Ayrshire. 13. Highland. 14. Welsh Cow. 15. Kerry Cow. 16. Dexter.

of the disease; five to fifty per cent. in the malignant form, which sometimes appears. The disease may last in a herd for a month or six weeks, although individually its duration is only eight to fourteen days.

For symptoms, treatment, and preventive measures, see FOOT-AND-MOUTH DISEASE.

Rinderpest, or *Cattle Plague*, is the most fatal of all cattle diseases. It is highly infectious, and attacks only ruminating animals. It has been known since the fourth century, its original habitat having probably been the steppes of Southern Russia. It has been estimated that during the first half of the eighteenth century, 200,000,000 cattle died in European countries from rinderpest. For some years the disease has played havoc with the cattle in South Africa, the last serious outbreak having occurred in 1902. It has been observed in various parts of America.

Rinderpest appears to be a form of septicæmia. The virus is both fixed and volatile. It exists in all the secretions and excretions of the body; can be conveyed by diseased animals and by intermediary bearers, gaining access to the blood through the respiratory or digestive passages. The poison remains infective for four or five months, but is not difficult to destroy by disinfectants. The period of incubation is from three to seven days.

Symptoms are, first, high fever, rapid pulse, shivering fits, loss of appetite, cessation of rumination and of milk secretion. The more characteristic symptoms are discharge from eyes, nose, and vagina in females; flow of saliva from the mouth; very violent, offensive diarrhœa, sometimes mixed with blood; red discolorations and patches on the mucous membranes of the mouth and vagina. These patches soon become covered with bran-like scales or crusts, which are shed, and leave red erosions or ulcers in the mucous membrane. There is great prostration; the animal lies down continually and grinds its teeth, the temperature falls, and death ensues. The mortality is from 90 to 95 per cent. One attack confers immunity for life, on recovery.

Treatment is useless. To prevent the spread of the disease the strictest precautions should be observed. Carcasses of animals dying should be burned or buried with quick lime and thorough disinfection should be practiced. Preventive inoculation has been tried with favorable results in South Africa.

Pleuro-pneumonia Contagiosa.—Contagious pleuro-pneumonia of cattle is a disease peculiar to the bovine race, and cannot be transmitted to other animals. It has been known since the seventeenth century, and consists of an infectious inflammation of the lungs and pleura. Its actual cause is unknown, but is probably a minute organism. The disease can be readily conveyed by diseased cattle, or by intermediate bearers, as attendants, litter, etc. Respired air is, however, the chief cause of infection. The virus may exist in infected sheds for a year or more and then become active, if there has been no disinfection. The period of incubation is from three to six weeks as a rule, but may be much longer. One attack confers immunity on recovered animals for years, and probably for life.

The mortality is from thirty to fifty per cent. From 1860 to 1892 this disease prevailed in the United States. It was finally eradicated in 1892, and has not occurred in this country since that date.

Symptoms are those of ordinary pleuro-pneumonia, with cough, difficulty in breathing, grunting, emaciation, fever, etc. There are two forms of the disease—the acute and the chronic. Postmortem examination reveals the characteristic marbled appearance of the lungs in section, due to broad bands of connective tissue surrounding the lobes. The lung tissue is hepatized, and of various colors.

Curative measures are useless and dangerous. All diseased animals, and all animals that have been in contact with diseased cattle, must be slaughtered; and there must be thorough disinfection of sheds, which must be kept vacant as long as possible. Also there should be strict port and frontier inspection of all foreign cattle.

Texas fever, also called red water, Southern cattle fever, etc., is an infectious blood disease characterized by high fever, emaciation and destruction of the red blood corpuscles. The blood parasite is carried from one animal to another by the cattle tick. The quarantine line for this disease extends along the northern line of the area infested with the tick. Texas fever may be fatal in from five to eight days, and the mortality is high. There is no efficient treatment. Susceptible cattle may be immunized by inoculating them with the blood of cattle which have recovered from the disease. This is effective in about 98 per cent. of cases. Some benefit is obtained from the injection of hemoglobin to replace that lost by the destruction of the red blood corpuscles. Recently a movement has been set on foot to eradicate Texas fever permanently by destruction of the tick. By a system of pasture rotation the cattle ticks may be starved to death.

Mycotic stomatitis, or sore mouth, is a sporadic, non-infectious disease, characterized by inflammation and ulceration of the oral mucous membranes, due to the ingestion of irritant fungi. There may be an associated swelling of the feet, and erosions may appear on the udder and teats. Treatment consists in removal of the herd from the pasture, careful feeding with bran mashes, ground feed, or gruels, and the use of a cleansing and antiseptic wash (as a 2 per cent. solution of carbolic acid), followed by an astringent. The disease is not, as a rule serious, and recovery, with proper treatment, is prompt, though fatal cases do occur.

Cattle also suffer from contagious abortion, infectious diarrhœa of calves, anthrax and actinomycosis (qq. v.), parturient paralysis, variola, and parasitic affections.

The Cattle Industry.—The cattle industry has reached a high state of development in the United States. The quality of the stock kept is improving, and more attention is paid to securing stock adapted to the purpose for which it is kept, and especially the needs of the butcher. The open range of the West is practically gone, although there are extensive areas held by cattle-men under fence. The breeding stock on these large ranches has been greatly improved, and this is reflected in the better grade of cattle received at the stockyards.

According to the reports of the Department of Agriculture, there were in the United States on January 1, 1920, about 23,747,000 milch cows, worth $2,021,681,000, and 44,485,000 other cattle, valued at $1,919,445,000, or a total of $3,941,126,000. Of these numbers only about 1¼ per cent. of the dairy cows and 1 per cent. of the other cattle are registered stock, the remainder being natives, grades, and crosses.

In connection with this article, see also DAIRYING; MILK; BUTTER; CHEESE; MEAT; PACKING INDUSTRY; FEEDING STUFFS; also the general article on STOCK RAISING and the special sections on *Stock Raising* in the articles on the various countries of the world.

Bibliography. — Consult Shaw's *Management and Feeding of Cattle* (1909); C. H. Eckles' *Dairy Cattle and Milk Production* (1911); Lydekker's *The Ox and Its Kindred* (1912); Wilcox' *Farm Animals;* also the numerous *Farmers' Bulletins* and Publications of the Bureau of Animal Industry on this subject.

Cattleya, kat′le-*a* *or* kat-lī′*a*, a genus of epiphytic orchids indigenous to Central and South America. There are about forty species, most of which are distinguished by large handsome flowers and rich coloring running through all the shades of white, rose, lilac, crimson, carmine, and yellow. They are the showiest of the orchids and have great commercial value owing to their decorative possibilities. They are comparatively easy of cultivation, thriving in a somewhat lower temperature than that required for most plants of a similar nature. For the culture of cattleyas see ORCHIDS.

Cattywar. See KATHIAWAR.

Catullus, k*a*-tul′us, GAIUS VALERIUS (*c.*87–*c.*54 B.C.), the greatest lyric poet of ancient Italy, was born in Verona. He appears to have belonged to the equestrian order, and his years were spent mainly at Rome, where he settled about 62 B.C., and at his villas, to which he was fond of retiring, at Tibur and Sirmio. In Rome he became intimate with the two Ciceros, the Metelli, Hortensius, and Lucretius, and there he met the lady whom, under the name of Lesbia, he celebrated in verses which stand at the head of the lyric poetry of passion. In 57 B.C., he accompanied the proprætor, Gaius Memmius, to his province of Bithynia. Returning to Rome, he entered impetuously into the contest which was then being waged between the senatorian and the democratic parties, espousing the cause of the senate.

Catullus' poems consist of 116 pieces, mostly of short length. Many of them are close imitations of Greek poetry, especially of the style of Callimachus of Alexandria; but it is rather on his love poems, satirical and society verses, and elegies that his reputation is founded. As compared with those of Horace, his lyrics are possibly rough; but it is the roughness of vigor and power, which was more congenial to the character and language of Rome than the polish of the later poets. Among his longer compositions are *Epithalamium Pelei et Thetidos, Coma Berenices*, and *Attis.* Editions include those of Postgate (1894), Palmer (1896), Owen (1893), R. Ellis (1889), Riese (1884). English verse translations have been made by Martin, Cranstoun, Ellis, Hart Davies, Grant Allen, and Cornish. Consult: W. Y. Sellar's *Roman Poets of the Republic.*

Catulus, kat′ū-lus, Roman family of the Lutatian clan. GAIUS LUTATIUS CATULUS was consul in 242 B.C., and proconsul in the next year, when he brought the first Punic War to an end by defeating the Carthaginian fleet near the Ægatian Islands. QUINTUS LUTATIUS CATULUS was consul in 102 B.C., and in the next year, as proconsul, succeeded, along with Marius, in annihilating the invading hordes of the Cimbri at Vercellæ. In politics he belonged to the aristocratic party and in the civil war of 87 B.C. was proscribed by Marius, and, unable to escape, committed suicide. QUINTUS LUTATIUS CATULUS, son of the above, was consul in 78 and censor in 65 B.C. Though a supporter of the aristocratic party, his upright character won him the respect of the people. He opposed, in 67 and 66 B.C., the Gabinian and Manilian laws, which conferred unusual powers on Pompey; was a keen opponent of Cæsar; and applauded Cicero's action in suppressing the conspiracy of Catiline. He died in 60 B.C.

Catumbella, kä-tōōm-bel′lä, or KATUMBELA, river in Angola, West Africa, rising northwest of Caconda (Kakonda). Near the mouth is the village of Catumbella.

Cauca, kou′kä′, department of Colombia, extending along the Pacific coast from the Gulf of Darien to the frontier of Ecuador. Area 20,403 square miles. It is mountainous, being traversed throughout its length by the Western Cordilleras of the Andes. The river valleys of the Atrato, San Juan and Patia in the western part are hot, damp, and unhealthful and are sparsely populated, but the Cauca valley in the central eastern part has a generally healthful climate and an exceedingly fertile soil in which tropical crops flourish. The department is rich in minerals, gold, silver, platinum, copper, salt, coal, and iron being found in the Cauca valley. Coffee, tobacco, cacao, sugar, and fruits are raised; the sugar and coffee being of excellent quality. Popayán (pop. 18,724) is the capital. Pop. 211,756.

Cauca, river of Colombia, which, rising in the Andes near Popayán, flows north and joins the Magdalena near Tacaloa. It is early 700 miles long and is navigable for a large part of its course. Its valley is exceedingly fertile.

Caucasian or **Caucasic Race,** a name given to the white race of mankind, as distinguished from the brown, yellow, and black, by Blumenbach, who, since the finest skull in his collection was Georgian, accepted the Caucasian as the highest type of the Indo-European stock. While the name is in reality a misnomer, since the peoples of the Caucasus do not fairly represent this highest branch of the human family, it has nevertheless been universally applied to the fair type of man as opposed to the black or yellow. Keane, in his *Man: Past and Present* (new ed., 1920), gives the range of the Caucasian peoples as all extra-tropical habitable lands except China Japan, and the Arctic zone and inter-tropical America, Arabia, India, and Indonesia. He divides them into three types; Mediterranean, Nordic, and Alpine. The first type includes most Iberians, Corsicans, Sards, Sicilians, Italians; some Greeks; Berbers, and other Hamites; Arabs and other Semites; some Hindus; Dravidians, Todas, Ainus, Indonesians, and some Polynesians. The Nordic type includes Scandinavians, Northwest Germans, Dutch, Flemings, most English, Scotch, some Irish, Anglo-Americans, Anglo-Australians, English and Dutch of South Africa; Thrako-Hellenes, true Kurds, most West Persians, Afghans, Dards and Siah-posh Kafirs. The Alpine type is composed of most French, South Germans, Swiss and Tyrolese; Russians, Poles, Czechs, Jugoslavs; some Albanians and Rumanians; Armenians, East Persians, and Galchas. For the characteristics of the race see ETHNOLOGY. Consult Tylor's *Anthropology*; Deniker's *The Races of Man;* Ripley's *Races of Europe;* Keane's *Man: Past and Present* (1920).

Caucasus, kô′k*a*-sus, a region of Southeastern Europe occupying the isthmus lying between the Black and Caspian Seas, with an area of 181,173 square miles, formerly a part of the Russian Empire. The main range of the Caucasus mountains (q. v.), which is the most striking natural feature of the region, divides it into two parts, Ciscaucasia in the North and Transcaucasia in the south. Ciscaucasia is generally level, an extension of the Russian plains, with many marshes and lagoons, but Transcaucasia is rugged and mountainous, traversed by parallel chains of the great mountain system. The chief rivers are the Kuban and Terek in the north and the Rion and Kura in the south. The only lakes are in Transcaucasia, the largest being Gok-cha in Erivan.

The climate, while generally healthful, is exceedingly varied, as is also the vegetation. In the north it is sparse and poor, but in the central part magnificent forests clothe the mountain slopes, and still farther south figs, chestnuts, pomegranates, and almonds flourish.

The mineral wealth is great, but is as yet little developed. Petroleum wells are numerous, the Baku fields being one of the world's great oil sources; mineral springs occur in many places; and coal, copper, iron, lead, sulphur, manganese, salt and some gold are found.

Agriculture is the chief occupation. Cereals, tobacco, cotton, and vines are raised. Mulberry trees are grown, and silk culture and wine making are of importance. The nomad tribes are occupied in cattle-grazing; the native peoples make rugs, woolen cloaks, and silver-trimmed articles, but manufacturing is in a primitive condition. Grain and petroleum are the chief exports. Railways run from Baku to Batum and Poti, from Baku to Petrovsk and Novorossiisk, and from Tiflis to Erivan, with a branch to Kars. A military road connects Vladikavkaz with Tiflis over the Dariel Pass (see DARIEL).

In 1915 the total population of the Caucasus was estimated at 13,229,000, including Circassians, Tatars, Turks, Lesghians, Kurds, Armenians, Georgians, Greeks, and Jews. The inhabitants belong to many religious sects and are often fanatical and superstitious. Tiflis is the capital, other important towns being Baku, Vladikavkaz, Derbend Erivan and Batum. A remarkable diversity of languages is spoken the chief division of which is known as the Alarodian. There are nearly 70 different dialects.

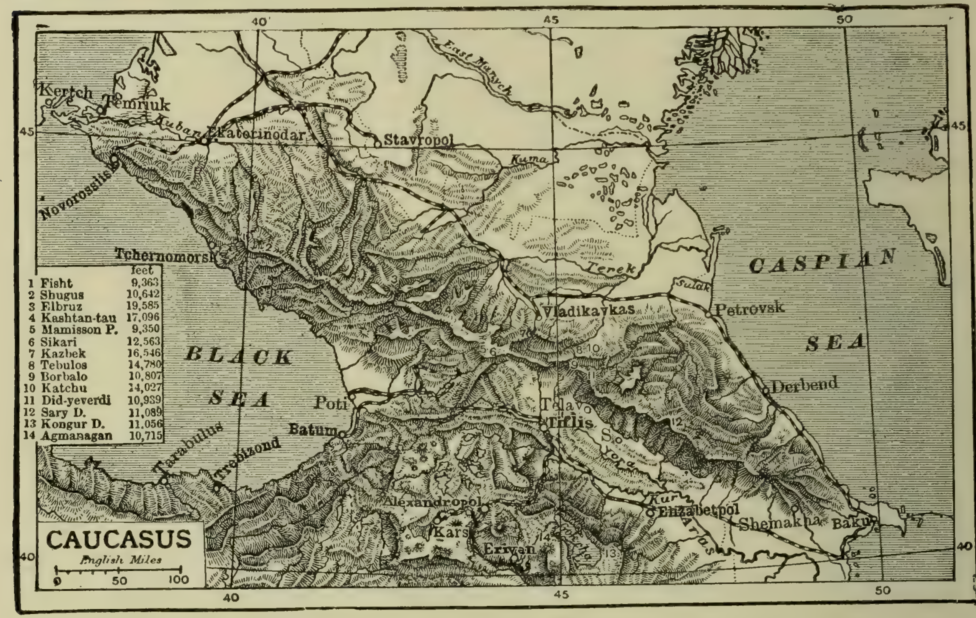
Under the Russian *régime* the Caucasus was divided for administrative purposes into Ciscaucasia, composed of the provinces of Kuban and Terek and the government of Stavropol, and Transcaucasia, composed of the provinces of Batum and Kars, the districts of Sukhum and Zakatatz and the governments of Baku, the Black Sea, Elizavetpol, Erivan, Kutais and Tiflis.

Under Peter the Great Russia began to be interested in the acquisition of the Caucasus and by the end of the eighteenth century she had acquired practically all of Ciscaucasia. By cessions from Persia and Turkey and by voluntary submission from some of the more peaceful tribes she had extended her control by 1830 to include nearly all of the region, but it required 30 years of fighting before the fearless mountain tribes were subdued. At last, in 1859, Shamzl, leader of the native peoples, surrendered, and by 1865 the conquest was completed. In the Russo-Turkish War (1877–8), Russia obtained a part of Turkish Armenia, which was annexed to the Caucasus. Following the Russian Revolution and the Great War (1914–19) republics were proclaimed in Georgia, Azerbaijan, and Kars. Armenia (q. v.) also laid claim to part of the area. Consult Freshfield's *Exploration of the Caucasus;* Abercomby's *A Trip through the Eastern Caucasus;* Baddeley's *The Russian Conquest of the Caucasus;* Graham's *A Vagabond in the Caucasus.*

Caucasus Mountains, kô'ka-sus, a lofty mountain chain, generally considered to be the boundary line between Europe and Asia, stretching from the Taman peninsula in the Black Sea to the Apsheron peninsula in the Caspian Sea, an extent of nearly 750 miles. The general direction of the system is from northwest to southeast. The higher and central part is formed of parallel chains averaging 12,000 feet in height, connected by elevated plateaus, traversed by narrow fissures of extreme depth. The highest peaks are Elbruz (18,470 feet), Koshtantau (16,900 feet), Dikhtau (17,000 feet), and Kazbek (16,546 feet). Elbruz and Kazbek are of volcanic origin. The range towers far above the snow-line, which here is between 10,000 and 11,000 feet. South of the main ranges, and separated from them by the valleys of the Kura and the Rion, is a series of lower ranges known as Little Caucasus.

The main Caucasus is composed of granite and ancient crystalline schists overlaid by sedimentary limestones and sandstones of Jurassic, Cretaceous and Old Tertiary age. The Kuban and Terek in the North and the Kura and Rion in the south are the chief rivers rising in the mountains. The most important passes are the military road through the Dariel Pass (see DARIEL) connecting Vladikavkaz with Tiflis, and the Derbend Pass near the Caspian Sea.

Consult Abich's *Geologische Forschungen in den Kaukasischen Ländern* (3 vols.



1878–87); Chantré's *Recherches Anthropologiques dans le Caucase* (4 vols. and altas, 1885–7); Wardrop's *The Kingdom of Georgia* (1888); Freshfield's *The Exploration of the Caucasus* (2 vols. 1896); Merzbacher's *Aus den Hochregionen des Kaukasus* (2 vols. 1901).

Cauchy, Augustin Louis, Baron (1789–1857), French mathematician, was professor (1816) at the Ecole Polytechnique, and at the Collège de France and the university, also member of the Institute. He became professor of mathematical astronomy at Paris in 1848. Amongst his very numerous and important works are: *Théorie des Ondes* (1815), crowned by the Institute; *Leçons sur les Applications du Calcul Infinitésimal à la Géométrie* (1816–28); *Leçons sur le Calcul Différentiel* (1829); *Mémoire sur la Dispersion de la Lumière* (1836). His *Œuvres Complètes* were published by the French Academy in twenty-six volumes (1882, etc.). See Valson's *Le Baron A. Cauchy* (2 vols. 1868).

Caucus, in politics, a meeting of supporters of a definite line of policy for the purpose of choosing representatives who will express their views, or of deciding upon some change of political creed. The term is also applied to the informal and secret meetings of party leaders, who seek, in advance of regular conventions or primary elections, to determine the course of such conventions or elections. In the legislative bodies of the states, as well as in the Federal Congress, the caucus of all the members of a party is employed to secure unity of party action. In the state legislatures the caucus usually decides upon whom the party shall support for United States Senator.

Cauda-galli Grit. See Corniferous Period. One of the New York formations belonging to the Devonian series. The rock is a rather close-textured, siliceous shale, characterized by the peculiar drooping fossil fucoid or plant which gives its name to the whole formation. It lies below the Onondaga limestone.

Caudium, an ancient tn. in Samnium, Italy, on the road between Capua and Beneventum. Near it was the pass known as the Furculæ Caudinæ, or Caudine Forks, in which a Roman army was compelled to surrender by the Samnites in 321 B.C.

Caul, a part of the amnion or fœtal membrane; receives this name when a child is born with it covering the head, instead of with the head piercing it, as is generally the case. To be born with a caul was, and in some places still is, considered lucky. The caul is also believed to bring luck to the person who afterward owns it, and especially to guard the bearer against drowning. Hence large sums were formerly paid for cauls by seamen.

Caulaincourt, Armand Augustin Louis, Marquis de (1772–1827), French statesman, born at Caulaincourt, Department of the Aisne. He was imprisoned as a royalist, but escaped. Under Bonaparte he became grand equerry (1804), general (1805) and finally (1808) Duke of Vicenza. After being Ambassador to Russia (1807), he shared in the Russian campaign, having vainly urged Napoleon against it. During the 'hundred days' he was Napoleon's Foreign Minister. The restoration deprived him of office and peerage. His memoirs appeared as *Souvenirs du Duc de Vicence* (1837–40).

Cauliflower. The cauliflower is, like the broccoli, a cabbage in which the flower stems and abortive flowers have been artificially developed. The crop grows best in a cool, moist climate. In the United States it grows especially well on Long Island and in some of the Northern Atlantic and Great Lake states. It requires a well-enriched, moist, loaming soil. The young plants are started and handled like cabbage plants. The plants in the field are set 18 inches apart, in rows about 2 ft. apart, and given thorough shallow cultivation. When the head is forming, the outer leaves are brought up over it and tied or pinned together. This gives a blanched, clean, white head, which otherwise would be of a dirty-brown color and of low market value. Snowball and Early Dwarf Erfurt are excellent sorts for either early or late crops.

Caulking, or Calking, the process of driving oakum (or old ropes untwisted and pulled asunder) into the seams of a ship's planks, in sides or decks, and covering it with pitch or rosin, to make the vessel tight.

Caulopteris, a name given to certain fossil tree-ferns, the external surface of which is densely covered with leaf scars, large, and more or less circular, enclosing another horseshoe-shaped mark. These stems are often silicified, and their interior structure can be perfectly made out. Some of them were of large size; it is believed that they may have been forty feet and more in height. They are especially characteristic of the Carboniferous formation, in which certain coal beds are practically entirely made up of the trunks of tree-ferns.

Caunus, an important ancient city on the S. coast of Caria, in Asia Minor, opposite the island of Rhodes; was a colony of Crete; famous for its dried figs.

Cauquénes, tn., Chili, cap. of Maule prov., 55 m. N.N.W. of Concepcion, on the S. bank of the Rio Maule, surrounded by grain fields and vineyards. Pop. 8,574.

Caura, territory of Venezuela, S. America, S. of the Orinoco R. Its products are chiefly tonka beans, the fruits of *Dipterix odorata*. It is drained by the Caura. The population is very small.

Caus, Caux, or Caulx (for all forms exist), Solomon (1576–1626), French engineer, born in Normandy; educated in England, where he spent his early years. He was in the service of the King of France (1620). In 1615 he published *Raisons des Forces Mouvantes avec Diverses Machines*, wherein he gave such unmistakable foreshadowing of the steam-engine that its invention has been claimed for him.

Causalgia, a term sometimes applied to a morbid condition of the peripheral end organs of nerves, and associated with a glossy appearance of the skin, with burning pain and possible ulceration, whitlows, and the shedding of nails. It is a variety of neuritis.

Cause. The Aristotelian doctrine of causation recognized four kinds of causes—material, formal, efficient, and final. Thus, in the case of a house, the stone and wood are the material cause, the plan of the house the formal cause, the builder the efficient cause, and the shelter which the house is intended to afford the purpose or final cause of its construction. In the case of organic or living things, to which probably Aristotle's scheme was primarily applied, the form—that is to say, the principle of life—is immanent from the beginning (though undeveloped), and is, moreover, when fully realized, itself the end or final cause of the organism. So that the formal and the final cause are here coincident and identical, while the efficient cause becomes merely the first impulse from without that starts the process of immanent self-development. The modern scientific doctrine of cause and effect is concerned primarily with mechanical processes, the fundamental feature being the uniformity of succession exhibited. If the phenomenon or set of conditions A B C is followed by the phenomenon or set of consequences α β γ on one occasion, it is assumed that the like set of conditions will be followed by the like set of consequences on every other occasion. Upon this general assumption the methods of physical science—*e.g.* the inductive methods analyzed by Mill—are based.

Two main problems have been discussed in connection with this fundamental assumption. The first of these, started and argued with great acuteness by Hume, is whether the assumption is a rational and necessary principle, or only a blind though persistent belief, produced in each particular case of its application by the constant association of ideas which results from the repetition of a particular sequence of events. Hume's continually reiterated ground for denying the necessity of the principle is that, so far as we can see *à priori*, a given phenomenon A might just as well cause the result β as its actual result α (for example, for anything we can see, bread might have been poisonous instead of nourishing); and the mere frequency with which α does follow upon A cannot generate a necessity which was absent from their first connection. But to this it must be replied: (1) that the particular necessity for the particular connection A—α is precisely the problem which science has to solve (for example, to discover why bread is nourishing, we must ascertain the chemical nature of bread on the one hand, and of human tissue on the other); (2) that the general principle asserts only the stability or necessity of causal connection in general, and does not promise us any insight into the particular nature of particular connections.

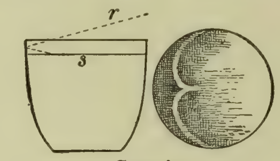
The second problem in connection with the principle of causality arises when the analysis of the causal relation is pushed to its logical conclusion. In the ordinary scientific use of the conception of causation, a distinction in time is assumed between the cause and the effect. Now, this distinction is possible only so long as our statement of the cause or conditions is incomplete. If all the conditions of an effect are given, the effect is given with them, being, in fact, nothing distinct from the totality of its conditions of partial causes: for example, the conjunction of gunpowder and a spark is already an explosion. It would seem, then, that with the complete statement of the conditions the element of time is eliminated. See J. Venn's *Empirical Logic* (1889), ch. ii.

Causerie (Fr.), an article dealing informally with matters of literary interest. The best known are the *Causeries du Lundi* of Sainte-Beuve, where, however, the causerie, like the essay, belies its humble title, and has become a very elaborate production.

Causses (Lat. *calx*, 'lime'), lofty calcareous plateaus in the deps. of Aveyron, Lozère, Gard, and Hérault, France, on the steep western slopes of the Cévennes (area, some 2,000 sq. m.). Numerous streams have excavated cañons that divide the plateaus into four main and many smaller 'causses' or promontories, the chief being Sauveterre, Méjean, Norie, and Larzac. Surface pits (*avens*), subterranean streams (the Tarn alone, in a distance of 31 m., receives thirty), and stalactite caverns abound. On the southern frontier of the Noire stands Montpellier-le-Vieux, 'the dolomite city.' See M. Betham-Edwards's *The Roof of France* (1889); E. A. Martel's *Les Cévennes et la Région des Causses* (1890).

Caustic, in chemistry, a term used for certain substances which have a corrosive action. 'Lunar caustic,' or nitrate of silver, is used in surgery to destroy and stimulate unhealthy and sluggish-healing surfaces. The word is used as a prefix to 'potash,' 'soda,' and 'lime,' indicating respectively the hydroxide of potassium (KOH) and of sodium (NaOH), and the oxide of calcium (CaO). All these have a corrosive action on cellular tissue, owing to their powerful attraction for water.

Caustic is the name given to the curve or surface of maximum brightness formed by the concentration of rays of light after they have been reflected from a reflecting surface, or refracted a new medium. One of the simplest and most familiar examples is the caustic formed on the surface of tea or coffee when light from a window or a flame falls on it after reflection from the polished interior side of the cup. The two-arched curve formed in this way separates the surface into two regions, on one of which no reflected ray whatever falls. All such rays pass through the other region, and every ray is a tangent to the caustic curve. Each point of the caustic may, therefore, be regarded as the meeting-point of two consecutive rays at least. Where the two caustic arches meet there is a comparatively great concentration of rays, so that this point, known as the focus, is much brighter than other parts of the caustic. Caustics may also be produced by rays which have been refracted; and here, because of the dispersion of the differently colored constituents of white light, beautiful color effects are frequently observed. Each ray forms its own caustic, slightly displaced from the caustic formed by a ray of a different color, so that the appearance is that of a colored band. A very good example of this is the ordinary rainbow.



Caustic.

r, Ray of light; s, surface of liquid.

Cautery (Gr. 'burner') is an instrument for the application of dry heat to the body tissues, so as to cause marked local irritation or even destruction of tissue, according to the degree of heat applied, and the time for which it is applied. The usual forms of cautery are the (1) actual, (2) thermo, (3) galvano, (4) hot air, and (5) cautery by concentrated solar rays. The actual cautery is heat directly applied through a heated metal instrument—*e.g.* Corrigan's button. The degree of heat (black, red, or white heat) is decided by the effect desired. Black heat acts as a counter-irritant; dull red heat is counter-irritant and styptic, besides destroying tissue locally. An instrument applied at a bright red heat destroys tissue, but does not form a good seal for stopping hæmorrhage. White heat forms no eschar at all, and so cannot be used to stop hæmorrhage; and a white-hot wire practically cuts like a knife. In Paquelin's cautery, and in similar instruments (thermo-cautery), the hollow blade to be applied is first heated in a spirit-lamp, and its heat is retained and regulated by means of spirit vapor driven through it. The galvano-cautery is heated by a galvanic current. Antisepsis must be secured, both in the surface to be cauterized and in the instruments, before the operation is performed. For the recent application of hot air and sun rays as cauterizing agents, it is claimed that no mechanical injury is done to the tissues, that healing is more satisfactory, and that scarring is much less.

Cautin. **(1.)** Coast prov., Chile; cap. Temuco. Area, 5,830 sq. m. Pop. (1895) 78,221. **(2.)** Or RIO IMPERIAL, riv., Chile, S. America. It rises on W. side of Andes, and flows W. for 180 m. to the Pacific.

Cautio. See ROMAN LAW.

Caution (Civil Law). A bond in which the debtor promises to pay at a future day money received. In England and France much the same as a surety, *which see.*

Cauto River, the largest riv. in Cuba. Rising in the mountains N. of Santiago de Cuba, it flows W. through a course of 120 m., 75 of which are navigable, to the head of the Golfo de Guacanabo.

Cauvery, riv., India, rising in the mountains of Coorg, flowing through Mysore (where, below Seringapatam, it descends in beautiful falls and rapids round the island of Sivasa-múdram) and Madras for about 475 miles, to empty itself by means of one of the largest deltas in India (northern arm, Coleroon; southern arm, Cauvery) into the Bay of Bengal.

Cava dei Tirreni, kä′vä dā′ē ter-rā′nē, town and episcopal see, Italy, in the province of Salerno; 6 miles northwest of Salerno. It is charmingly situated among wooded hills and is a favorite resort in the warmer months. A little to the south is the famous Benedictine monastery of La Trinità della Cava, founded in 1025, containing valuable archives, now the property of the nation. The chief industry is the manufacture of textiles. Pop. (1920) 8,691.

Cavaignac, kå-vā-nyak′, JACQUES MARIE EUGÈNE GODEFROY (1853–1905), French public official, son of Louis Eugène Cavaignac, was born in Paris. He entered the army and was decorated for bravery in the Franco-German War. Subsequently he studied engineering and law, but from 1882 devoted himself to political life. He entered the Chamber as a republican in 1882, was under-secretary of war in 1885, and minister of marine in 1892. As minister of war in Brisson's cabinet (1898), he played a prominent part in the Dreyfus affair (q.v.), but upon the discovery of the Henry forgery, he resigned rather than countenance a new trial of Dreyfus. He wrote *La formation de la Prusse contemporaine* (1891–8).

Cavaignac, LOUIS EUGÈNE (1802–57), French soldier and politician, was born in Paris. He served with distinction in Algeria, and in 1844 was appointed general of brigade. In the revolution of 1848 he was made governor-general of Algeria; but was soon recalled to Paris, where, as minister of war and dictator, he drove the insurgents from the barricades in a series of sanguinary engagements. The risings having been quelled, Cavaignac resigned his dictatorship, but was immediately appointed president of the Council. He was a candidate for president of the republic, but was defeated by Louis Napoleon. Though a quiescent spectator of the *coup d'état* of 1851, he was temporarily imprisoned. Consult *Life* by Deschamps (2 vols.).

Cavaillon, kå′vå′yoN′ (anc. *Cabellio*), town, France, in the department of Vaucluse; 14 miles southeast of Avignon. The culture of silk worms is a flourishing industry, and the town boasts a model silkworm-rearing establishment. Olives, melons, and the vine are grown. Roman remains have been found in the vicinity. Pop. (1921) 8,991.

Cavalcanti, kä′val-kän′tē, GUIDO (*c.* 1255–1300), Italian poet, was born in Florence of a Guelf family. In 1300, when the Guelfs divided into factions, the Blacks and Whites, and the former were in the ascendant, Guido, as a White, was exiled to Sarzana, but because of ill health was permitted to return to Florence, where he died. He was a warm friend of Dante, who dedicated to him his *Vita Nuova*, and who refers to him in the *Inferno*, the *Purgatorio*, and the *De Vulgari Eloquentia*. Cavalcanti's most famous poem is the *canzone* on the Essence of Love (*Donna mi prego*), which contains much original thought. His other lyrics are less philosophical, but more beautiful, his ballads and pastorals being especially charming. The best edition of the poems is Ercole's *Guido Cavalcanti e le sue Rime* (1885). Consult, also, Rossetti's *Dante and his Circle*.

Cavalcaselle, kä-väl-kä-sel′lā, GIOVANNI BATTISTA (1820–97), Italian author and art critic, was born in Legnago. He studied art in Venice and Munich, and having taken part in the Italian revolution of 1848, was obliged to seek refuge in London. There, in collaboration with Joseph Crowe, he prepared *Early Flemish Painters* (1857), which is still a standard work. After his return to Italy, he published his *History of Italian Painting* (1864–71), and biographies of Titian (1877) and of Raphael (1863), in which he was assisted by Crowe. In 1876 he was appointed Chief Inspector of Antiquities and Fine Arts in Rome.

Cavalier, kav-a-lēr′, a horseman, whence a knight, a gentleman. The name is perhaps most familiar as applied to the followers of Charles I. of England. It survived until the struggle over the Exclusion Bill in 1679, when it gave place to Tory. See also CHEVALIER.

Cavalieri, kä-vä-lyā′rē, EMILIO DEL (*c.* 1550–*c.* 1602), Italian composer, was born in Rome, and spent most of his life at the court of Ferdinand de' Medici, where he was on intimate terms with the leading artists and musicians of the day. He was one of the earliest advocates of instrumental accompaniment and one of the first to employ vocal ornament, such as *tremolo*. His work comprises four musical dramas—*Il satiro, La disperazione di Fileno, Il giuoco della cieca,* and *La rappresentazione di anima e di corpo*. The last of these is regarded as the first Italian oratorio.

Cavalla, kä-väl′lä, more correctly KAVALA, seaport, Greece, on the Gulf of Cavalla (Ægean Sea). It is in a rich tobacco growing district, and large amounts of that commodity are exported. Cavalla formerly belonged to Turkey but was allotted to Greece at the close of the Balkan War. It was the birthplace of Mehemet Ali. Pop. (1920) 22,939.

Cavalotti, kä-vä-lot′tē, FELICE (1842–98), Italian writer and politician, was born in Milan. In 1860, after publishing a bitter attack on Germany, *Germania e Italia*, he joined the forces of Garibaldi. Later he opposed the monarchy, and as editor of the *Gazzettino* proved himself a thorough democrat and radical. He was killed in a political duel in 1898. His publications include the dramas *Alcibiade, Messeni* and *Cantico de' Cantice*, and *Il Libro dei Versi*.

Cav′alry, soldiers organized and armed with rifle, pistol, and sabre, mounted on horses, and trained to fight either on horseback or on foot. As an arm of the military service it has been exceedingly important in the past, but it is of less value in modern warfare, in which battles take the form of struggles for the possession of trenches, forts, and other fixed positions.

When operating with other troops, the duties of the cavalry are, in general, to cover the movements of their own troops, to secure information of the movements of hostile troops, to break up the hostile advance, to make raids, and to seize and hold advanced positions. During combat, it operates against the hostile flanks, takes advantage of breaks in the enemy's lines, fills up gaps that may occur in its own lines, and acts as a highly mobile reserve. After battle, its duties are to pursue and harass the enemy or, if its own troops are defeated, to cover their retirement.

In covering the movements of its own troops, use is made of patrols varying in size from an officer and six or eight privates to a troop or even a squadron. These patrols form a screen in front of and on the flanks of their own troops, often at considerable distances, being connected in such a way as to prevent penetration by hostile patrols. They gather and transmit information of the enemy, at the same time preventing hostile patrols from gaining information about their own movements. When contact is established with the enemy, large patrols are sent out to engage it, develop its strength, and harass its advance.

Cavalry in Mounted Fighting.—The effect of cavalry on unbroken infantry has hitherto usually been moral rather than actual, and in view of the efficiency of modern firearms, this is more than ever the case in the present day. This 'shock action' must be prepared for by a concentrated artillery fire so as to demoralize the enemy as much as possible. If the element of surprise is introduced, however, a cavalry charge has a great chance of success. Against shaken or flying infantry it is always effective. Naturally, considering that speed is the great desideratum in its attacks, the question of suitable ground for the manœuvring of cavalry is all-important. There are many striking historical examples of the disastrous effect produced on charging cavalry by sudden unforeseen natural obstacles: the sunken road at Waterloo is a case in point.

Except in small forces, the charge is made in two successive waves or lines, about 150 yards apart. During the advance and prior to the attack, scouts or patrols cover the movement, reconnoitre for the enemy, select routes, open fences, and otherwise assist the advance. Combat patrols provide security for the flanks and rear. The formation of the attacking troops and the method of attack depend upon the situation. In every mounted attack, the command is divided into a reserve and an attack echelon. The reserve follows the attack echelon at from 100 to 400 yards. The attack echelon usually contains the bulk of the force and is deployed in two or more waves, the rear waves in support of the leading wave. As the approaching forces near each other, the scouts or covering patrols are absorbed in the attack echelon, which tries to deceive the enemy as to its point of attack. If possible, the main blow is made either to envelop or strike the enemy in flank. Each succeeding wave protects a flank of the wave in front, rear waves attempting to outflank the hostile force. The reserve protects the flanks of the attack echelon, strikes the decisive blow, pursues the enemy, meets counter blows, or covers the withdrawal of the attack echelon if it is defeated.

Cavalry in Dismounted Fighting.—The custom of occasionally dismounting cavalry and making them fight on foot, first used with distinguished success by the Federal forces in the American Civil War, has been steadily growing. The modern tendency, however, is to use cavalry for fighting purposes almost entirely as mounted infantry; and although the continental nations of Europe still consider the lance and sword as useful cavalry weapons, the carbine and automatic rifle are now regarded as the most valuable arms. By using the horse as a means of rapidly covering long distances, cavalry is superior to infantry for making those wide turning movements in attacking an enemy which are necessitated by modern tactics.

In the ***United States Army*** there are fifteen regiments of cavalry, the strength of which is fixed by executive order, under the provisions of the amended National Defense Act of June 6, 1920. These fifteen regiments are organized into one complete cavalry division, one incomplete division, and seven separate regiments.

The cavalry division consists of: headquarters and the headquarters troops, signal, ordnance, and veterinary; two cavalry brigades; one battalion of horse artillery; one mounted engineer battalion; one ambulance company; one division train; attached medical troops.

The brigade is composed of: brigade headquarters and headquarters troop, two regiments of cavalry, and a machine-gun squadron of four troops.

The regiment comprises: regimental headquarters, headquarters troop, service troop, and two squadrons of three rifle troops each.

The normal peace strength of a cavalry division is 6,072 officers, warrant officers, and enlisted men; of a brigade, 2,803; of a regiment, 1,155, but for reasons of economy, all units at present are maintained at about 70 per cent. of peace strength. Several divisions may be combined into a cavalry corps for the execution of a special mission.

An army includes among its component parts two cavalry divisions. Cavalry does not form an integral part of the army corps or of the division, but is assigned to each for duty when its use is indicated.

The cavalry recruit must be between 5 ft. 4 in. and 5 ft. 10 in. in height and weigh not over 165 pounds. The United States has two remount depots, one at Fort Reno, Oklahoma, and one at Front Royal, Virginia, where horses bought in open market or bred at the depots are trained for the mounted services.

For the historical development of Cavalry see ARMY.

Cavan, kav′an, inland county of Ireland, in Ulster; area, 746 square miles. The surface is mountainous in the northwest, with numerous streams and several lakes. The principal river is the Erne. Coal, iron, and copper occur, and there are mineral springs. Agriculture is the chief industry, but, except in the valleys, the soil is poor. Linen bleaching is also important. Pop. 90,000.

Cavatina, kä-vä-tē′nä, a term originally meaning a one-part song but later applied to a smooth melodious air forming part of a grand movement. Mozart's *Andromeda*, Mendelssohn's *St. Paul*, and many other operas contain examples.

Cave, EDWARD (1691–1754), English printer, was born in Newton, near Rugby. In 1731 he founded the *Gentleman's Magazine*, which he edited under the *nom de plume* of 'Sylvanus Urban' until his death in 1754.

Cave, WILLIAM (1637–1713), English divine, was born in Pickwell, Leicestershire. After being chaplain to Charles II., he was canon of Windsor (1684), and vicar of Isleworth, Middlesex (1690), till his death. He wrote *Primitive Christianity* (1672), *Antiquitates Apostolicæ* (1678), and *Scriptorum Ecclesiasticorum Historia Literaria* (1688–98).

Cave Animals, a term used in zoology in two senses—first, and most legitimately, for fauna living in caves (*i.e.*, animals which have been structurally modified to fit them for this mode of life); second, as a convenient designation of various mammals of which fossils are found in Pleistocene deposits in European caves, to distinguish them from their living allies. In this latter sense we speak of the cave bear (*Ursus spelæus*), the cave lion, and the cave hyæna, though these were not in any special sense cave-dwelling animals.

The true cave dwellers are usually much modified in accordance with their habitat, especially as regards eyes and coloring. The conditions which obtain in the larger caves are not unlike those at great depths of the sea; and in the partial or complete suppression of eyes and the development of special tactile organs the members of the two faunas show a marked resemblance. *Proteus anguineus* of the caves of Carniola and Dalmatia, is a blind, colorless, amphibian, which retains throughout life the external gills present only in the young of many other amphibians—*e.g.*, the common frog. In captivity it shows itself sensitive to light, and if persistently exposed to it, becomes dark colored, or even black. An analogous amphibian, *Typhomolge rathbuni*, has been found in caves in Texas. It has concealed eyes and is colorless. Other cave animals include fish, notably the famous blind fish Amblyopsis (q.v.) of the Mammoth Cave in Kentucky; beetles, such as the carabids (see CARABIDÆ), especially the members of the widely distributed genus *Anophthalamus*, and silphids (*e.g.*, *Adelops*); carnivorous grasshoppers, as *Dolichopoda palpata* and other forms; myriapods, spiders, and crustacea. Consult Packard's *Cave Fauna of North America*.

Caveat, kā′vi-at (Latin, 'let

him beware'), is a formal notice given to one holding public or judicial office, that he is not to perform a certain act without first giving intimation to the caveator or person giving the notice. The term is derived from the canon law, being the initial word of an ecclesiastical writ, issued, for example, to hinder the presentation or collation of an undesirable person to a benefice. In modern times it is used extensively to prevent probate of a will, or administration of the estates of an intestate being granted to a third party without the caveator being heard.

Caveats are also of importance in patent practice, when one who has made an invention but wishes time to perfect it seeks to prevent a patent for the same invention being granted to another without his claim to priority of discovery being considered. In the United States, that part of the Patent Law providing for caveats was rescinded in 1910, and they are no longer issued. See PATENT.

Caveat actor ('let the doer beware') is a legal maxim which, in certain exceptional circumstances, makes a person fully responsible for any loss or damage resulting from his acts, quite irrespective of any intention or negligence on his part. The maxim will apply, for example, where the defendant was a trespasser on the plaintiff's land, or where a lion or other ferocious animal kept by the defendant has caused injury to the plaintiff.

Caveat emptor ('let the purchaser beware') is a principle of modern commercial law, which requires a buyer to make an inspection on his own account of the articles he is purchasing, and in the absence of an express warranty frees the seller from any claim on the ground that certain faults were not pointed out. This rule, of course, holds good only where the purchaser has the opportunity of making an inspection, and is not compelled to rely on the word of the vendor.

Cavedone, kä-vā-dō′nā, GIACOMO (1577–1660), Italian painter, was born in Sassuolo, near Modena. He studied under Ludovico Carracci at Bologna, where he settled, becoming for a time assistant to Guido. His chief works are *The Last Supper*, *Among the Doctors*, and a fine *Madonna and Child.*

Cave Dwellings. See CLIFF DWELLERS; MOUND DWELLINGS; TROGLODYTES; UNDERGROUND DWELLINGS.

Cavell′, EDITH (1865–1915), British nurse, was born in Swardeston, Norfolk, was educated in London and Brussels, and received her training as a nurse in the London Hospital. After holding various hospital positions, she was in 1907 appointed matron of the Berkendael Medical Institute, Brussels, a training school for secular nurses, which, following the outbreak of the Great War, became a Red Cross hospital. While continuing her work in the hospital, Miss Cavell was active in assisting allied soldiers to escape, by means of false credentials, across the Dutch frontier. In August 1915 she was arrested by the German police, and having admitted the charges against her, was found guilty and was shot as a spy, Oct. 11, 1915. In May 1919, after a memorial service in Westminster Abbey, her body was removed to Norwich cathedral.

Cavendish, pseudonym of HENRY JONES (q.v.).

Cav′endish, LORD FREDERICK CHARLES (1836–82), second son of the seventh Duke of Devonshire, was born in Eastbourne, Sussex. From 1859 to 1864 he acted as private secretary to Lord Granville, and in 1865 he entered Parliament for the West Riding of Yorkshire, a constituency he represented till his death. He was private secretary to Gladstone (1872), a junior Lord of the Treasury (1873–80), and financial secretary of the Treasury (1880–82). Appointed chief secretary to the Lord Lieutenant of Ireland, Earl Spencer, he took the oath of office on May 6, 1882. On the same day he and T. H. Burke, an unpopular subordinate, were stabbed to death in Phœnix Park, Dublin. Eight months later, twenty 'Irish Invincibles' were tried for the murder; three turned Queen's evidence, five of the rest were hanged, three sentenced to penal servitude for life, and the remaining nine to various terms of imprisonment.

Cavendish, GEORGE (? 1500–1561), biographer of Wolsey, became Wolsey's gentleman usher, and remained in close attendance upon him till his death (1530), when he retired to Glemsford, in Suffolk, having married a niece of Sir Thomas More. About 1560 he wrote his *Life of Cardinal Wolsey*, one of the most interesting short biographies in the English language. Its pensive wisdom and simple sincerity reflect a pleasing picture of the gentle and refined nature of its author, and enable us to see intimately with our own eyes the outlines of one of the great figures in history.

Cavendish, HENRY (1731–1810), English natural philosopher, was born in Nice, France, and devoted his life to scientific investigations. As a philosopher he is entitled to the highest rank. In 1760 he discovered the extreme levity of inflammable air, now known as hydrogen gas—a discovery which led to balloon experiments and projects for aerial navigation; and later he ascertained that water resulted from the union of two gases. The famous *Cavendish Experiment* was an ingenious device for estimating the density of the earth. Cavendish also wrote on astronomical instruments and his *Electrical Researches* (1771–81) were edited by Clerk Maxwell. Consult Wilson's *Life.*

Cavendish, MARGARET. See NEWCASTLE, DUKES OF.

Cavendish, THOMAS (1560–1592), English navigator, was born near Ipswich, England. He shared in Grenville's expedition to Virginia (1585). In 1586 he sailed from Plymouth with three ships, and by way of Sierra Leone and Brazil reached the Strait of Magellan. During his cruise in the Pacific he burned three Spanish towns and numerous ships. Then, with a rich booty, he returned by way of the Indian Archipelago and the Cape of Good Hope to England—completing his circumnavigation of the globe in 1588. In 1591 he sailed on a second expedition, which ended in disaster.

Cavendish, WILLIAM (1592–1676), duke of Newcastle, became a favorite at the court of James I., who in 1620 created him Viscount Mansfield. Charles I. in 1628 made him earl of Newcastle, and in 1638 appointed him governor to his son, afterward Charles II. He loyally supported the King in the Civil Wars, and was general of the forces north of the Tweed. After the Battle of Marston Moor (1644), he retired to the Continent, where he resided till the Restoration.

Cavendish Family. See DEVONSHIRE.

Cave of Adullam. See ADULLAM; ADULLAMITES.

Cave of the Winds. See NIAGARA RIVER AND FALLS.

Caves, natural depressions in the earth's crust, formed by the action of such agencies as air, water, and volcanic upheavals. According to the method of their formation, caves may be divided into several groups. The sea caves, so numerous on rocky coasts, are the result of the action of the waves, which, casting sand and gravel against the cliff, have gradually undermined it. This takes place most rapidly along lines of fracture and fissures, which are readily eaten into, with the formation of depressions. In this process the air, too, plays an important part; driven by the pressure of the advancing water into every crevice of the rock, it suddenly expands and dislodges showers of fragments when the wave falls back. In this way a cave is often carried far beyond the limits reached by the waves themselves, and may tunnel upward, emerging at the surface at a considerable distance from the edge of the cliff. Such 'blow holes,' sending out puffs of spray with every wave of a storm, are frequent on rocky shores. In raised beaches (q. v.) caves due to the force of the waves at an earlier period are often quite dry, and are even used for human habitation.

An even greater number of caves are due to the action of spring water and underground rivers dissolving the rocks in which they circulate. As limestone is of all common rocks the most soluble in spring water containing carbonic acid, caves occur oftenest in this rock. Familiar examples of such caves are the Mammoth Cave (q.v.) and other caves of Kentucky; the Luray Cavern (see LURAY) of Virginia; Jenolan in New South Wales; the Adelsberg Grotto (see ADELSBERG) in Carniola, and Matlock in Derbyshire. In extensive tracts of limestone the rivers may flow entirely in underground channels, while the surface is an arid desert, as in the Causses (q.v.) in Central France. These channels are a succession of vaulted chambers, with pillars and pendent columns deposited by the water dripping from the roof (see STALACTITES AND STALAGMITES); or the roofs may fall in, leaving circular sinks in the ground above (see SINKHOLES).

Another group of caves, which may be better described as rock shelters, is found in inland cliffs, where hard and soft beds alternate. The soft layers are readily eaten back by the action of frost and rain, forming shallow recesses.

Lava caves are characteristic of volcanic regions and are due to the escape of the central part of a lava flow at a period when the surface cooled to form a hard crust, while the interior was still liquid. Large caves of this kind occur in the Sandwich Islands and in Iceland.

Not only have natural caves frequently been the refuge of primeval man and of many of his descendants, but there gradually developed the practice of artificially improving and elaborating such shelters, and ultimately of hewing out habitations in what was previously solid rock. The cave temples of India, as those at Elephanta, although they are not actual dwellings, are probably the finest illustrations of this custom; other examples occur in Asia Minor and in North Africa. The cliff dwellings of Arizona are also partly cut out of the rock. Consult Shaler's *Sea and Land;* Lubbock's *Origin of Civilization;* Lyell's *Antiquity of Man;* Hovey's *Celebrated American Caverns.*

Caviare, kav-i-är', the salted roe (immature ovaries) of the sturgeon (*Acipenser sturio*), considered a table delicacy. To prepare it the roe are beaten with twigs to separate the eggs from the membrane; the mass is then rubbed over a fine wire screen, through which the eggs drop into a container below, salt is added and carefully stirred until it forms a brine. The brine is poured off, and the eggs are packed in kegs. The best caviare comes from Russia, near Astrakhan and the Volga, but large quantities are also prepared in Sweden, Norway, and Germany. In the United States eggs of fish other than sturgeon are prepared as caviare; the product must, however, be labelled with the name of the fish used.

Cavite, province, Luzon, Philippine Islands, bordering on Manila Bay, and adjoining the provinces of Manila, Laguna de Bay, La Laguna, and Batangas; area 510 square miles. It is mountainous but fertile; the principal products being sugar, rice, coffee, and indigo. Sugar refining and the manufacture of cotton and hemp cloth are the leading industries. Pop. (1918) 157,355.

Cavite, kä-vē-tä', city, Luzon, Philippine Islands, capital of Cavite province, is situated on a small promontory, 9 miles southwest of Manila. It is a walled town with buildings of stone and regularly laid out streets. It is the terminus of a railway from Manila, the chief naval station of the archipelago, and has an arsenal, fortifications, dock-yard, dry dock, hospital, and convents. Tobacco manufacture is an important industry. Near by is Terra Alta, a sanatorium for foreigners. Pop. (1918) 22,169.

Cavour, kä-vo͞or', COUNT CAMILLO BENSO DI (1810–61), restorer of Italian unity and nationality, was born in Turin, then capital of Sardinia, a descendant of one of the ancient noble families of Piedmont. He attended the military academy in his native city, and upon completing his course was appointed to a post in the engineers, which he resigned in 1831, retiring to private life.

In 1847, in conjunction with Count Cesare Balbo (q.v.), Cavour established a newspaper, *Il Risorgimento*, in which he advocated a representative system of government, somewhat after the English pattern. On his suggestion, the king was petitioned for a constitution, and this was granted in February 1848. In the Chamber of Deputies, which he entered in 1848, Cavour strenuously opposed the ultra-democrats, and counselled an alliance with England. In the Marquis d'Azeglio's ministry he was successively Minister of Agriculture and Commerce, Minister of Marine, and Minister of Finance. In 1852 he was appointed to succeed D'Azeglio as Premier, and from this time devoted himself to bringing about the unification of Italy. Taking upon himself at different times, in addition to the premiership, the duties of the ministry of finance, commerce, and agriculture, and latterly of home and foreign affairs, he greatly improved the financial condition of the country, introduced measures of free trade, consolidated constitutionalism, weakened clerical influence, and made Sardinia a power of some account in Europe.

It was through Cavour's advice and influence that Sardinia took part in the Crimean War, and as a result of this he managed to bring the Italian question before the Congress of Paris in 1856. In 1858 he had with the Emperor Napoleon a secret meeting, at which the programme for driving Austria out of Italy was drawn up; and during the early part of 1859 there followed a diplomatic contest with Austria, which Cavour conducted with masterly tact and astuteness. The Peace of Villafranca, coming after the successful war of 1859, and leaving Austria in possession of Venetia, was a bitter disappointment to Cavour. He resigned his office; yet he had no reason for despair, as the power of Austria in the Italian peninsula was really broken. On returning to office in 1860 he resumed his great undertaking, but by new methods. Still keeping the one great end in view, he secured the absorption of Parma, Modena, and Tuscany into the dominions of Victor Emmanuel; but to appease France, he was compelled to acquiesce in the cession of Savoy and Nice. For this he was much blamed by Garibaldi and his sympathizers. In March, 1860, the states of Central Italy acknowledged the sovereignty of Victor Emmanuel, and by autumn the Sardinian troops and their Garibaldian allies had secured the Papal States and Southern Italy. In the spring of 1861 the first Italian Parliament met at Turin, and Victor Emmanuel was King of Italy. Cavour, worn out in public life, died in that city in the following June.

Consult *Lives* of Cavour, by Massari (1873), Mazade (1877), Edward Dicey (1861), and Gottschall (1876); *La politique de Cavour*, by C. Bianchi; *Cavour*, by F. X. Kraus; his *Letters*, edited by Chiala; *Le Comte de Cavour: récits et souvenirs*, by De la Rive; *Camillo di Cavour*, by Ciro d'Areo; Orsi's *Cavour and the Making of Modern Italy, 1810–1861.*

Ca′vy, a small rodent of the family Caviidæ found in South and Central America. The true cavies are small animals, with short legs and ears and a complete absence of tail; the wild forms, uniformly colored, live chiefly in burrows excavated by themselves and are timid and shy. They often furnish food for man and for other animals. Among the best known species are the Restless Cavy (*C. porcellus*), a small greyish brown creature found in Brazil, and Cutler's Cavy (*C. cutleri*), almost black in color and generally thought to be the ancestor of the domesticated guinea pig (q.v.). The Patagonian cavy (*Dolichotis patagonica*), now nearly extinct, is much larger, resembling the hare in size and appearance, but having longer legs. The capybara and agouti (qq. v.) are near relatives.

Caw′dor, village, Scotland, in Nairn county; 10 miles northeast of Inverness. It is the traditional scene of Duncan's murder (Shakespeare's *Macbeth*) in 1040, but the castle dates only from 1454. Pop. of par. (1921) 838.

Cawein, kä-win′, Madison Julius (1865–1914), American poet, was born in Louisville, Ky. He began the composition of verse at an early age, and in 1887 published his first book, *Blooms of the Berry*, which received warm praise for its delicate appreciation of nature. Other volumes include: *Accolon of Gaul* (1889); *Red Leaves and Roses* (1893); *Poems of Nature and Love* (1893); *The Garden of Dreams* (1896); *Myth and Romance* (1899); *Kentucky Poems* (1902); *The Vale of Tempe* (1905); *Nature Notes and Impressions* (1906); *The Shadow Garden* (1910); *The Republic* (1913); *The Cup of Comus* (1914). He was a member of the National Institute of Arts and Letters.

Cawnpur, kôn′po͞or, or Cawnpore, chief city of the district of Cawnpore, United Provinces, India, on the south bank of the Ganges, 46 miles southeast of Lucknow. The British maintain a large military cantonment here and have made the city the commercial centre of Northern India. There is trade in grain and other agricultural produce, and cotton and leather goods are manufactured. Cawnpur was the scene of tragic events during the Sepoy Mutiny of 1857. An exhausted garrison of Europeans, which, under promise of safe-conduct to Allahabad, had surrendered to Nana Sahib, the adopted son of the last Peishwa, were fired upon as they embarked on the river; and the women and children rescued from this massacre were brought back to the city and foully butchered. The events of the mutiny are commemorated by the Memorial Gardens and the Memorial Church. Pop. (1921) 216,436.

Caxamarca. See Cajamarca.

Caxias, kä-shē-äsh′, town, Brazil, in Maranhão, on the left bank of the Itapicuru; 200 miles southeast of Maranhão. It has trade in rice and cotton. Pop. 15,000.

Cax′ton, William (*c.* 1421–91), the first English printer, was born near Hadlow in Kent. He was apprenticed to a mercer in London, at whose death (1441) he left England, and settled in Bruges. There he remained for more than thirty years, the last eight or nine of which he was governor of the English Merchant Adventurers in that city. In 1474, with the co-operation of Colard Mansion, a printer of Bruges, he issued his *Recuyell of the Historyes of Troye*, the first book printed in English, followed in 1475 by *The Game and Plays of the Chesse*. Returning to England in 1476, Caxton set up a printing press near Westminster Abbey and for fifteen years he assiduously printed chivalric romances, religious works, and translations, all of which he edited and twenty-two of which he translated. The *Dictes and Sayings of the Philosophers*, published in 1477, is believed to have been the first work actually printed in England. His books, numbering 99, all printed in black letter, included Malory's *King Arthur*, translations of Cicero's *De Senectute* and *De Amicitia*, and editions of Chaucer, Lydgate, and Gower. Upon Caxton's death, his materials passed into the hands of his assistant, Wynkyn de Worde (q.v.).

By Ewing Galloway, N. Y.

Cawnpur: Memorial Cross over the Well in which the Bodies of the Mutiny Victims were Buried.

Consult *Life and Typography of William Caxton* and *The Biography and Typography of Caxton*, both by William Blades; also *Lives*, by Ames, Dibdin, and Lewis. Lowndes' *Bibliographers' Manual* (1834) contains a list of the works issued from Caxton's press.

Cayambe, kī-äm′bā, a volcano in Ecuador, 50 miles northeast of Quito. It stands almost on the equator, rising to an altitude of 19,255 feet.

Caycos. See Caicos.

Cayenne, kä-en′ *or* kī-en′, capital of French Guiana (South America) and the only port in the colony, is situated on the northwest shore of Cayenne Island, between the Cayenne and Mahury Rivers. It is the seat of a college and has a museum and library. It was once the site of a penal settlement. The Isle du Diable, on which Dreyfus was incarcerated, lies 30 miles to the northwest. Pop. (1921) 10,146.

Cayenne Pepper. See Pepper.

Cayes, Aux, ō kā′, seaport town, Haiti, on the southern coast; 100 miles southwest of Port-au-Prince. It is the seat of a bishopric and of a United States consular agency. Exports include coffee, sugar, and dyewoods. Pop. 15,000.

Cay′ley, Arthur (1821–95), English mathematician, was born in Richmond, in Surrey. He distinguished himself as a student at Cambridge, and in 1863 was elected to the Sadlerian professorship of mathematics there. His address as president of the British Association in 1883 became historic, as it foreshadowed many developments in mathematical science that have since taken place. In 1882 he visited the United States, where he lectured in Johns Hopkins University. Cayley contributed to nearly every subject in the range of pure mathematics. Specially noteworthy are his theory of invariants and convariants; the introduction of the 'absolute' into the discussion of metrical properties; his theories in analytical geometry in regard to curves and surfaces, and his memoir on matrices in the development of branches of algebra. As a writer he is best known by his *Elementary Treatise on Elliptic Functions* (1876; 2nd ed. 1895), and by his papers, amounting to more than nine hundred, which were published by the Cambridge University Press (1889–98).

Caylus, kä-lüs′, Anne Claude Philippe de Tubières, Comte de (1692–1765), French engraver and archæologist, was born in Paris and served in Spain in the war of the Austrian Succession. Later he travelled extensively, devoting himself to the pursuit and encouragement of art in all its forms. He was an accomplished etcher, producing an enormous number of plates, some of which are valuable as preserving the works of celebrated artists. His attempt to discover the site and ruins of Troy and other explorations are described in his work *Recueil d' antiquités egyptiennes, étrusques, grecques, romaines, et gauloises* (7 vols., 1752–67). Besides this, he wrote biographies of Mignard, Lemoine, Bouchardon, and Watteau, and other works which were published under the title *Œuvres badines* (12 vols., 1787). Consult Rocheblave's *Essai sur le Comte de Caylus.*

Caylus, Marie Marguerite le Valois de Villette de Murcay, Comtesse de (1672–1729), cousin of Mme. de Maintenon, and herself an ornament of the court of Louis xiv., was born in Paris. Her interesting *Souvenirs* were published by Voltaire at Geneva (1770; reprinted 1804, 1860, and 1879). Comte de Caylus, the archæologist, was her son.

Cayman. See Caiman.

Cay'mans, or Cayman Islands, three islands (Grand Cayman, Little Cayman, and Cayman Brac) in the Caribbean Sea; 180 miles northwest of Jamaica, of which they form a dependency. They are of coral formation and are very fertile. Good fishing grounds surround them, and great natural caves extend under their shores. Grand Cayman is 17 miles long by 4 to 7 miles broad. Its capital is Boddentown. The chief exports are dyewoods, phosphates, fish, and turtles. Cocoanuts from Cayman Brac and Little Cayman form an important article of export. Pop. (1921) 5,253.

Cayor, kī-ōr', or Kayor, district of Senegal, on the west coast of Africa, between the Senegal River and Cape Verde; inhabited by Joloffs or Yolofs. The soil is fertile and produces cotton, indigo, and grain. Pop. 150,000.

Cayster, kā-is'ter, river in Asia Minor, flowing into the sea northwest of Ephesus. Homer alludes to its swans, which still abound.

Cayuga, kä-yo͞o'ga, lake of glacial origin in the central part of New York State, stretching north and south for 35 miles, with a maximum breadth of 2 to 3 miles, and an elevation of 381 feet. It drains north to Lake Ontario by the Seneca and Oswego Rivers. The city of Ithaca (q.v.) stands at its head.

Cayuga, a tribe of North American Indians belonging to the Iroquoian confederation. They formerly lived near the shores of Cayuga Lake, New York, but at the beginning of the American Revolution a large number of them removed to Canada and never returned. At present some are in Oklahoma, some in New York, near Cayuga, and the majority on the Grand River reservation in Ontario.

Cayuse, kī-ūs', tribe of North American Indians, formerly living near the Umatilla River, Oregon, and in Washington. They are closely associated with the Nez Percés and are noted for their bravery. They now number about 300, all on the Umatilla Reservation, Oregon.

Cayvan, ka-van', Georgia Eva (1860–1906), American actress, was born in Bath, Me. Her first appearance as an actress was as Hebe in *Pinafore,* in 1879. The following year she appeared at the Madison Square Theatre, New York, as Dolly in *Hazel Kirke.* Later parts were Daisy Brown in *The Professor,* Liza in *The White Slave,* and Lura in *Romany Rye.* She played in San Francisco and other cities, was at one period in Dion Boucicault's Company, and from 1887 to 1894 was leading lady in Daniel Frohman's Lyceum Theatre Company. After one or two seasons of starring on her own account, she retired from the stage in 1897 on account of ill health.

Cazembe, kä-zem'bē, or Kazembe, the name given to a district in Central Africa formerly ruled over by an African chief whose hereditary title was also Cazembe. It lies near the southern end of Lake Mweru and is now divided between Rhodesia and the Belgian Congo.

Cazin, kȧ-zăṅ', Jean Charles (1841–1901), French landscape painter, was born in Samer (Pas-de-Calais). After obtaining his degree at the University of Lille, he studied under Lecoq de Boisbaudran and later went to England, where he interested himself in ceramic designing. He returned to France in 1875, and after 1883 painted chiefly landscapes, simple and beautiful in coloring and full of melancholy sentiment. In 1889 he was made Chevalier of the Legion of Honor. His best known works are *The Flight into Egypt, The Journey of Tobias, The Departure of Mary and Joseph from Judæa, Hagar and Ishmael, A Dead City, The Marne, The Bathers.*

C. E., abbreviation for civil engineer; Christian Endeavor.

Ceadda. See Chad, St.

Cean-Bermudez, thā'än-bermo͞o'dath, Juan Agustin (1749–1829), Spanish man of letters, was born in Gijon. He was a pupil of Mengs, court painter to Charles iii., and a well-known and prolific writer on Spanish art. His principal work, which is still the leading authority on its subject, is *Diccionario historico de los mas illustres profesores de las bellas artes en España* (6 vols. 1800). He also wrote a *Life* of his friend Jovellanos (1814) and published descriptions of works of art and antiquities in Spain.

Ce'ano'thus, a genus of small American trees or shrubs of the Buckthorn family (Rhamnaceæ). They are cultivated chiefly for ornamental purposes and are more commonly found on the Pacific coast. *C. americanus,* known also as New Jersey Tea or Redroot, is a hardy shrub with dense panicles of white flowers, whose leaves are said to be used as a substitute for tea. *C. thyrsiflorus,* known as the California Lilac, bears clusters of fragrant blue flowers like miniature lilac blooms.

Ceará, sā-ä-rä', state, Brazil, on the Atlantic coast, between Piauhy and Rio Grande do Norte; area 40,241 square miles. The surface slopes upward from the sandy coast on the north, forming great rolling plains, culminating in a series of low ranges in the south. The climate is generally hot, and droughts are common. The streams are small, and of little value for navigation. In some parts the soil is fertile, producing sugar, tobacco, cotton, and coffee. The woods yield timber, and there are good pasture lands. The leading industries are cotton spinning and rubber manufacture. The capital is Fortaleza. Pop. (1920) 1,319,228.

Ceará. See Fortaleza.

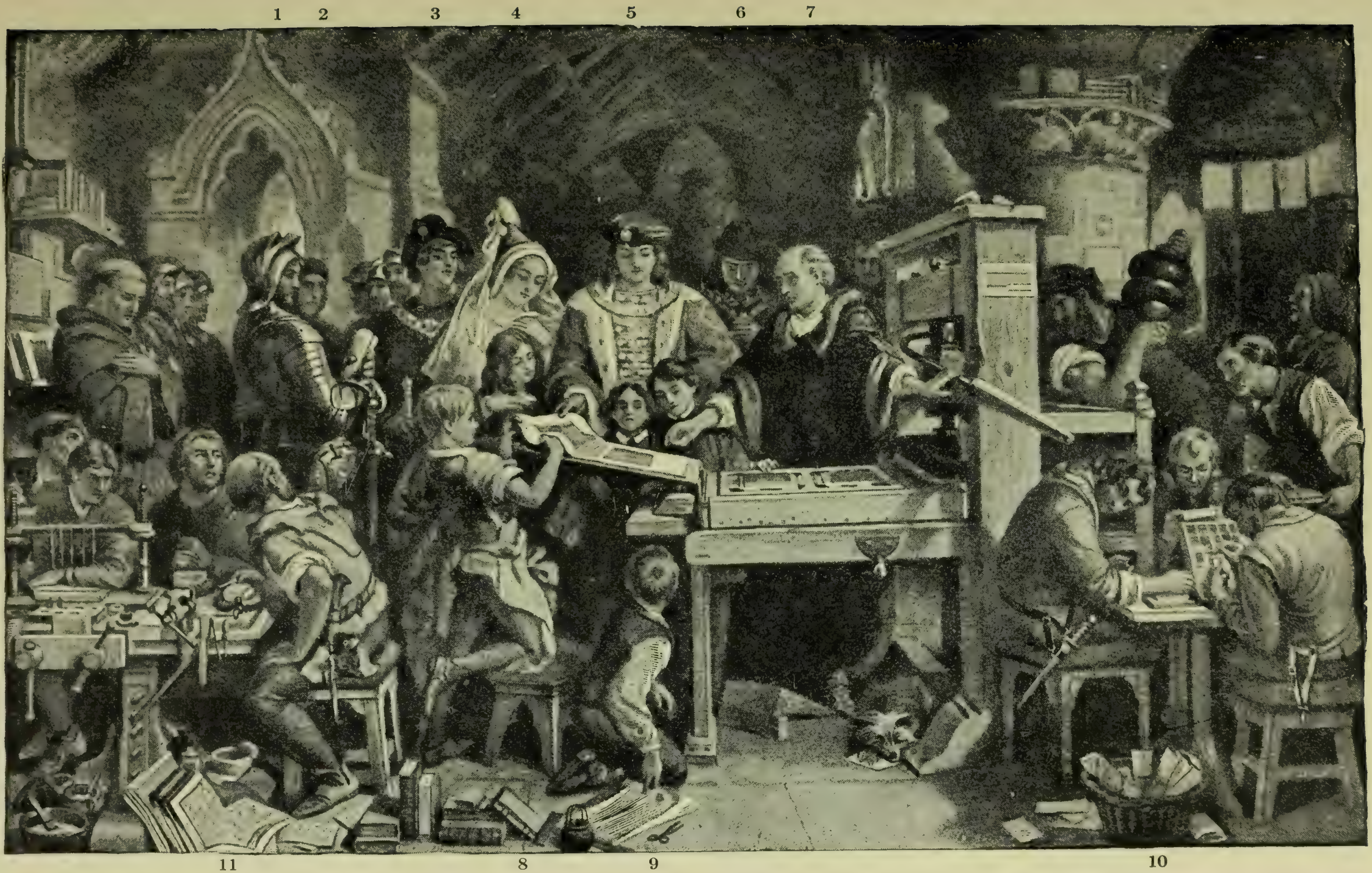
Ceará Mirim, mē-rēṅ', town, Brazil, in the state of Rio Grande do Norte, on the Ceará Mirim river. Cattle-grazing and the manufacture of cotton and sugar are the leading industries. Pop. 18,000.

Cebadilla. See Sabadilla.

Cebenna. See Cévennes.

Cebes, sē'bēz, a Theban, a disciple of the Pythagorean philosopher Philolaus, and also of Socrates, at whose death he was present. Plato, in his *Phædo,* which describes Socrates' last hours, makes him the most important character, after Socrates, in the dialogue. Diogenes Laertius says he wrote three dialogues, the *Pinax, Hebdome,* and *Phrynichus;* none are extant, though there exists under the name of the first a work which was formerly accepted as his. It discusses the trials and temptations of life, and inculcates the cultivation of philosophy and virtue as the only method of escape. The text has been edited by Prächter (1893) and, with notes, by Jerram (1878).

Cebidæ, seb'ĭ-dē, a family of monkeys entirely confined to South America, and including the capuchins (genus Cebus), howling monkeys, spider monkeys, woolly monkeys, and others.



CAXTON'S PRINTING OFFICE IN THE ALMONRY AT WESTMINSTER

(Painted by Daniel Maclise, R. A. Reproduced by Permission of the Earl of Lytton.)

Explanation of Figures.—1. Earl Rivers, Caxton's patron. 2. The Abbot of Westminster. 3. The Duke of Clarence. 4. The Queen of Edward IV. 5. King Edward IV. 6. Richard of Gloucester. 7. Wallace Caxton. 8. Princess Elizabeth of York. 9. The young Princes murdered in the Tower. 10. Compositors and pressmen. 11. Bookbinders, engravers, and illuminators.

Cebu, sä-bōō′, *Span. pron.* thä-vōō′, one of the Philippine Islands, situated about the middle of the Visayan group. It is 139 miles long and 24 miles wide, with an area of 1,695 square miles. A mountain chain extends along its greater axis. Though Uling, the highest peak, is only 2,172 feet, the narrowness of the island makes the slopes so steep that communication between the east and west shores is difficult. Rainfall is abundant, and the soil is fertile, producing sugar, hemp, tobacco, rice, and cotton. Coal, silver, lead, and petroleum have been discovered, and there are forests of building woods. The island is famous for its cheese; and cocoanut wine, piña cloth, silk, and sinamay are manufactured. The rare shell, *gloria maris*, and the glass sponge, or Venus' flower basket (q. v.), have been found along its shores. Pop. (1918) 855,065.

Cebu, town, Philippine Islands, capital of the province of Cebu, on the eastern coast, 357 miles southeast of Manila. Sheltered behind Mactan Island, it has one of the finest harbors in the Philippines. Features of the town are the cathedral, with a tower of white coral; the picturesque old fort; the episcopal palace, and the 'Rizal,' a small building containing a cross reputed to have been planted in Cebu by Magellan, who is said to have died on Mactan Island (1521). Cebu is an important commercial centre. It was the capital of the islands from 1565 to 1571. Pop. (1918) 65,502.

Cecchi, chek′kē, Antonio (1849–96), Italian traveller, was born in Pesaro. In 1876 he accompanied the expedition of the Marquis Antinori to Abyssinia. He mapped the route from Zeila to Shoa. In 1885, at the request of the Italian government, he accompanied a mission to Massowah, explored the coast, and concluded a treaty of commerce with the Sultan of Zanzibar. He wrote *Da Zeila alle frontiere del Caffa* (3 vols. 1886), and *L'Abissinia settentrionale* (1887).

Cech, cheK, Svatopluk (1846–1908), one of the foremost of the Czech poets, was born in Ostredac, and educated in Prague. His style is natural, graceful, and vigorous, and his writing is characterized by a satiric humor. He is at his best in epic poems, such as *Adamité* (1873) and *The Dream*, which, with several others, appeared in 1874, under the title *Poems*. Another collection of poems was published in 1880, including *Europe* and *The Circassian*. Cech also wrote the novels *Povidky, Arabesky a Humoresky* (4 vols. 1878–80), and *The Candidate for Immortality* (1884). He founded the review *Kvety*, which he edited for twenty years.

Cecidomyiidæ, ses-i-do-mī′-yi-de, or Gall Gnats, a family of minute flies with hairy bodies, many-jointed antennæ, and slightly veined wings. The larvæ are often destructive to crops, most of them forming galls on the leaves and twigs of plants. The best known member of the family is the Hessian Fly (q. v.). Some European species have been known to give birth to young while in the larval stage (pædogenesis).

Cecil, ses′il, Lord Edward Herbert (1867–1918), British soldier (D.S.O.), was the fourth son of the third Marquis of Salisbury. He was with the Dongola expeditionary force in 1896 as aide-de-camp to Kitchener, and was present at Firket and Hafir. In the campaign (1898) which led to the reconquest of the Sudan he was again aide-de-camp to Kitchener, and took part in the battles of the Atbara and Khartum. Lord Cecil accompanied a special mission to King Menelik of Abyssinia (1897), and on the outbreak of the Boer War (1899) he took a leading part in the defence of Mafeking, under Baden-Powell. In 1902 he was appointed military secretary to the Sirdar of the Egyptian Army, and in 1903–5 director of intelligence in the Sudan. He was Under-Secretary of State for Finance in Egypt, 1905–12, and from that time till his death was financial adviser to the Egyptian government.

Cecil, Lord Hugh Richard Heathcote (1869–), British member of Parliament, was the youngest son of the third Marquis of Salisbury. He was private secretary to his father (1895–1906), and member of Parliament for Greenwich (1895–1906) and for Oxford University (1910–). During the Great War he was lieutenant in the Royal Flying Corps. He is distinguished for his high Christian idealism and is one of the most influential private members in the House.

Cecil, Robert. See Salisbury, Marquis of.

Cecil, Robert, Viscount Cecil of Chetwood (1864–), British statesman, son of the third Marquis of Salisbury, was called to the bar in 1887 and became a King's Counsel in 1899. He was private secretary to his father during the latter's premiership (1886–8), was member of Parliament for East Marylebone (1906–10) and for the Hitchen division of Herts (1912–23); was Under-Secretary for Foreign Affairs (1915–16); Assistant Secretary for Foreign Affairs (1918), and Minister of Blockade (1916–18). In 1919 he went to Paris to assist in the formation of the League of Nations, of which he was later vice-president and at whose first assembly (1920) he represented South Africa. In 1924 he was awarded the Wilson Foundation prize for his efforts towards international peace. He was created a peer, taking the title Viscount Cecil of Chetwood, in 1923.

Cecil, William. See Burleigh, Lord.

Cecilia, sē-sil′i-*a*, Saint, the patron saint of music, a Roman maiden of noble family who is said to have been martyred under Alexander Severus, about 230 A.D. It is related of her that, on the eve of her marriage to the heathen Valerianus, she converted him to Christianity. Valerianus was martyred by the sword and she herself was thrown into a boiling bath; when this failed to kill her, she was beheaded. Cecilia has been regarded as the inventor of the organ, and in paintings is generally depicted as seated at that instrument, attended by angels or saints; notable examples are the paintings of Raphael, Carlo Dolci, Rubens, Domenichino, Reynolds, and Copley. Her festal day is November 22.

Cecropia, sē-kro′pi-*a*, a genus of soft-wooded, milky-juiced trees belonging to the order Moraceæ, found in most tropical regions. *C. peltata*, the best known species, also known as the Trumpet Tree or Snakewood, is native to the West Indies and South America. It has hollow branches, with membraneous partitions at the nodes, on the removal of which the branches may be fashioned into wind instruments. The fruit is a small, one-seeded nut resembling a raspberry in taste. The tree contains a saline matter used in purifying sugar, the bark furnishes an astringent and is also used for cordage, and the wood is so light that it readily ignites under friction.

Cecrops, sē′krops, the mythical founder and first King of Athens. To him are attributed the institution of marriage, abolition of human sacrifice, and establishment of a purer worship.

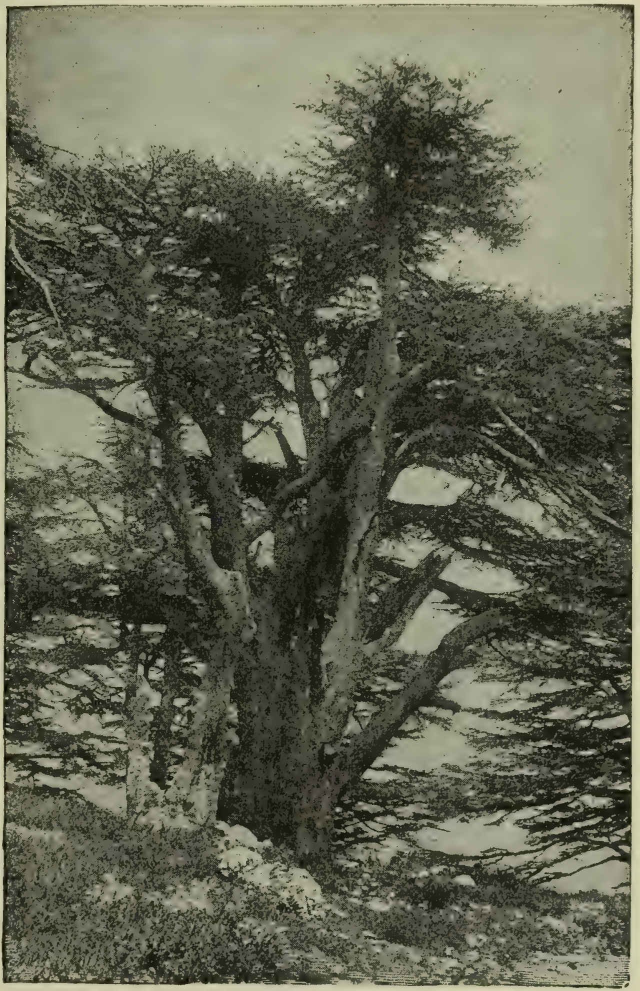
Cedar, a genus of beautiful coniferous trees with persistent foliage and large spreading branches. There are three closely allied species, *Cedrus atlantica*, a native of North Africa, a large pyramidal tree growing to a height of 120 feet; *C. deodora*, found in the Himalayas; and *C. libani* or the Cedar of Lebanon. Cedars furnish a valuable timber, light, durable, and easily worked. It is supposed to be the shittim wood of the Bible. The cedars of Lebanon are by no means so impressive and numerous as once they were. There were in 1917 about 400 of them standing, but even these were destroyed in the course of the Great War. *C. libani* grows slowly and is notable for its large trunk and wide-spreading branches. It exudes a kind of white resin formerly used in embalming. *C. deodora* and *C. atlantica* are similar in appearance to *C. libani;* the former is abundant in the Himalayas, and its wood is valuable for cabinet work.

In the United States the name cedar is applied loosely to species of *Cedrela, Juniper* and *Chamæcyparis.* The White Cedar (*Chamæcyparis thyoides*), found along the Atlantic seaboard, is really a cypress. It grows in swampy ground to a height of from 40 to 80 feet, and its timber is used for interior finishing, barrels, fences, boats, and small woodenware. The so-called Red Cedar (*Juniperus virginiana*) is a species of juniper found east of the Rocky Mountains. It has fragrant red wood, soft and easily worked, which is used for pencils, chests, interior finishing, and fence posts. The West Indian Cedar (Cedrela) furnishes a reddish wood largely used in making cigar boxes. See also JUNIPER.

Cedar Bird. See WAXWING.

Cedar Creek, BATTLE OF, a battle of the American Civil War, fought on Oct. 19, 1864, at Cedar Creek, a small stream in the Shenandoah Valley, Va., between about 19,000 Confederates under General Early and about 30,000 Federals, first under General Wright and later under General Sheridan; the last engagement in Sheridan's campaign against Early in the Shenandoah Valley. Sheridan had gone to Washington to confer with the Federal authorities, leaving Wright in command, when Early surprised his army, at first driving it in some confusion before him for about four miles. Sheridan, having reached Winchester on his return from Washington and hearing the firing, hastened on horseback to the scene of action, and reformed the Federal lines; and his disheartened troops, inspired with new enthusiasm by the presence of their popular commander, routed the Confederates. The Federal loss in killed, wounded, and captured was about 5,600; that of the Confederates about 2,900. Sheridan's ride from Winchester to the battlefield is commemorated by Thomas Buchanan Read's poem, *Sheridan's Ride.*

Cedar Falls, city, Iowa, Black Hawk county, on Cedar River, and on the Chicago Great Western, the Chicago, Rock Island and Pacific, and the Illinois Central Railroads; 93 miles west of Dubuque. Pershing Way, Red Ball Route, Grant Highway, Black Diamond Trail, and the Short Line and Iowa Park Highways all pass through Cedar Falls. A free tourist camp is maintained in Island Park. The city is the seat of the Iowa State Teachers' College, and has the Sartori Public Library. The abundant water power is utilized in manufacturing lumber, furniture, canned vegetables, farm gates, cereals, flour, and agricultural implements. Pop. (1910) 5,012; (1920) 6,316.


A Cedar of Lebanon.

Cedar Gum, a yellow transparent resin used in making varnish and in various medicinal preparations. It is obtained from *Lallitris arborea.*

Cedar Mountain, BATTLE OF, a battle of the American Civil War, fought on Aug. 9, 1862, at Cedar Mountain, Culpeper county, Va., between a Confederate force of about 20,000 under Gen. 'Stonewall' Jackson, and a Federal force of about 8,000 under Gen. N. P. Banks. Jackson had been ordered by General Lee to attack the van of General Pope's Federal army, and was himself impetuously attacked by General Banks, who, in spite of his inferior force, at first threw the Confederates into confusion, but was finally beaten back and defeated. The Federal loss in killed and wounded was about 2,300; that of the Confederates about 1,300.

Cedar Oil, an essential oil obtained from *Juniperus virginiana* (sp. gr. .9622). Its use in mounting microscopical specimens was originally suggested by Professor Abbe.

Cedar Rapids, city, Iowa, Linn county, on the Cedar River, and on the Chicago, Milwaukee and St. Paul, the Chicago, Rock Island and Pacific, the Chicago and North Western, and the Illinois Central Railroads; 64 miles southwest of Dubuque. Cedar Rapids is the seat of Coe College (1881) and has two schools, a business college, Masonic Temple, and Masonic and Public Libraries. The city's valuable water-power accounts for its rapid growth. Industrial establishments, according to the Federal Census of Manufactures for 1919, number 208, with $39,055,539, capital and products valued at $92,118,386. They include packing houses and foundries, and manufactures of pumps, farming implements, corn products, and cereals. Pop. (1900) 25,656; (1910) 32,811; (1920) 45,566.

Cedar River, or Red Cedar River, a left bank tributary of the Iowa River, rises in Freeborn and Mower counties, Minnesota, near the southern border, and flows southeast across Iowa to within 12 miles of the Mississippi, where it turns southwest and joins the Iowa. It is about 300 miles long.

Cedartown, town, Georgia, county seat of Polk county, on the Central of Georgia, and the Seaboard Air Line Railroads; 53 miles northwest of Atlanta. The region is productive in pine and cedar. Lumber, paper, paper boxes, hosiery, cotton, cotton-seed oil, and flour are manufactured, and large iron mines are operated in the vicinity. Pop. (1910) 3,551; (1920) 4,053.

Cedar Waxwing. See Waxwing.

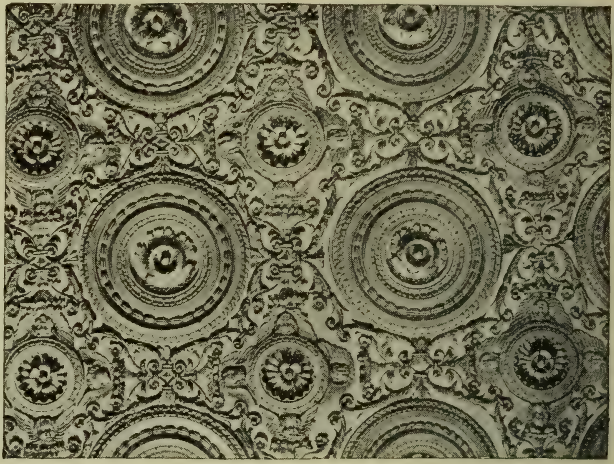
Cedula, sed'ū-l*a*, or Cedola (Ital.), a Spanish word derived from the Latin *schedula*, 'a small piece of paper.' It may designate a certificate of indebtedness, a promissory note, a government security, a personal registration tax, or any one of numerous other certificates.

Cefalù, chā-fä-lo͞o', town and episcopal see, Sicily, in the province of Palermo, on the northern coast; 42 miles southeast of Palermo. The most striking feature of the town is the Norman cathedral, erected in the twelfth century, and containing some remarkable mosaics. There are also ruins of a Norman castle, of a temple of Diana, and of the ancient Cephalœdium, destroyed by the Saracens in A.D. 858. Sardine fishing is the chief industry. Pop. (1911) 14,341.

Ceglie, chāl'yā, town, Italy, in Lecce province; 19 miles northeast of Taranto. There is trade in fruit and grain. Pop. 20,000.

Cehegin, thā-ā-hēn', town, Spain, province of Murcia; 37 miles northwest of Murcia. It produces cereals, wine, hemp, honey, and great quantities of esparto, of which paper is made. There are black marble quarries in the vicinity. Pop. (1910) 13,313.

Ceiling, the covering of an interior wall surface, more particularly of the underside of a floor, which provides the roofing or enclosure at the top of a room or other space below. The ancient Egyptian temples and palaces were covered with flat stone slabs, and the walls and ceilings were frequently rendered smooth with a coating of plaster. Ceiling decoration was generally geometrical, i.e. intricate combinations of curves and straight lines, and color was employed boldly. The Babylonians and Assyrians inclined to vaulted ceilings, covered, like the walls, with a form of stucco adorned with vivid coloring. Arched ceilings, known as cameræ, were employed by the Romans, but flat ceilings were in more general use; the beams were at first visible, but in later developments were covered with planks and plaster. Sometimes hollow spaces were left between the beams, which were frequently covered with gold and ivory, or with paintings or 'pateræ'—large flowers—such, for instance, as are used in the panels of the vault of the Pantheon. In Byzantine architecture the ceilings were richly embellished with mosaics of bright color.



Decorated Ceiling (*Italian*).

From the Ducal Palace, Venice (Renaissance).

Ceilings of churches in the Middle Ages were often painted and brilliantly gilded. The older ceilings generally followed the line of the roof timbers, which, in the Early English and Decorated, were often arranged so as to give the shape of a barrel vault. In ceilings of this description there seldom are many ribs, sometimes only a single one along the top. In the Perpendicular style, the ceiling often consists of a series of flat surfaces or cants, formed on the timbers of the roof. They are enriched with ribs, dividing them into square panels, with bosses or flowers at the intersections. Wooden ceilings are sometimes formed like stone-groining, with ribs and bosses, as at York, Winchester, and Lincoln. In the Elizabethan age ceilings were generally of plaster, but were ornamented with ribs having bosses or small pendants at the intersections.

At the present time flat ceiling decoration takes four main forms: a revival of mixed gesso painting or modelling on plaster; covering with an imitation of plaster work or wood carving; applying printed or embossed paper; and attaching metal ceilings. See also Fresco and Mural Decoration.

Celakovsky, or Czelakowski, Frantisek Ladislav (1799–1852), Bohemian poet and philologist, was born in Strakonitz. He was educated in the University of Prague, and held the chair of Slav philology at Breslau (1842) and at Prague (1849). His works include collections of folk-songs and poems, notably *Rüze Stolista* ('Rose with a Hundred Leaves') and *Ohlas Pisni Ruskych* ('Echoes of Russian Songs'). At the time of his death he was engaged in preparing a supplement to Jungmann's Bohemian Dictionary. Among numerous translations which he made was a version of Scott's *Lady of the Lake*. His son, Lad-

ISLAV CELAKOVSKY (1834–1902), was professor of botany at the university of his native town of Prague from 1871 to his death. His works include *Prodromus der Flora von Böhmen* (1867–81); *Vergleichende Darstellung der Placenten in den Fruchtknoten der Phanerogamen* (1876); *Die Gymnospermen* (1890).

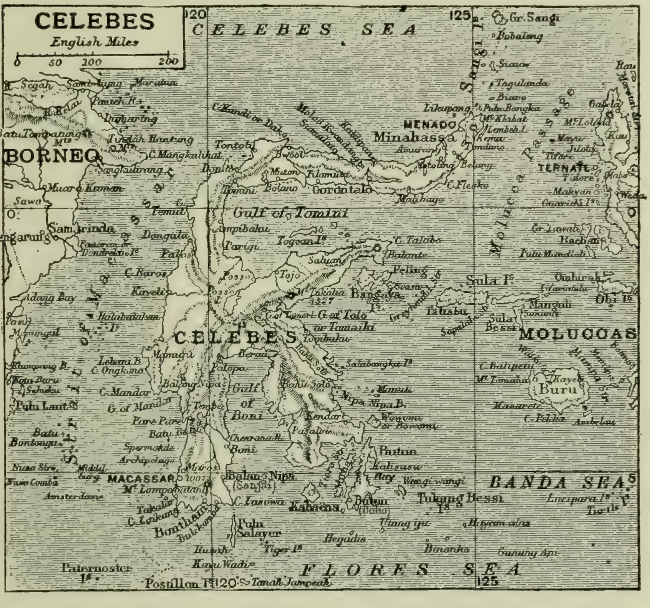
Celandine, a term applied to two very dissimilar plants. One, the greater celandine (*Chelidonium majus*), known also as swallow-wort, belongs to the order Papaveraceæ, and is a perennial plant, bearing stalked umbels of small yellow flowers and soft, irregularly pinnate leaves; whereas the lesser celandine (*Ranunculus Ficaria*) belongs to the order Ranunculaceæ, and is a perennial plant, bearing bright yellow, buttercup-like flowers in early spring, the petals being about nine in number. The leaves are heart-shaped.

Celano, THOMAS DE (d. ?1255), Latin poet, born at Celano in the Abruzzi; adherent of St. Francis, and custodian of the Minorite convent at Worms from 1221 to 1230. His claim to the authorship of the great Latin hymn *Dies Iræ* is generally admitted.

Celaya, tn., state of Guanajuato, Mexico, 220 m. by rail from the capital; noted for its cloth, carpets, and sweetmeats. Alt. 6,410 ft. Pop. (1900) 25,565.

Celebes, a singularly shaped island in the Dutch East Indies, lies E. of Borneo, being separated from it by the Strait of Macassar. It consists of a long, narrow backbone stretching N. to S., from which similar long, narrow, octopus-like arms point E., N.E., and S.E., separated from each other by the Gulfs of Tomini, Tomori (Tomaiki), and Boni. The N.E. extremity of the N. arm, called Minahassa, and the S. extremity of the main axis, called Macassar, are the only parts which are really well known. Minahassa is of recent volcanic origin, rising to 7,500 ft. in Mt. Kema. In the S. Macassar runs up to 10,070 ft. in Bobokaraeng and 10,000 ft. in Bonthaeng (Bonthian). Another characteristic feature is the number of lakes, mostly at considerable altitudes, and some of great size, such as Lake Posso, in the centre, 1,640 ft. above sea-level; Lake Tondano, in Minahassa, 2,000 ft. Professor Alfred Russel Wallace believes that Celebes is a framework which is gradually growing into the full roundness of another Borneo; Professor O. Peschel, on the other hand, regards it as the skeleton of a once larger island; and Dr. Wickmann holds what seems to be an intermediate view. Messrs. P. and F. Sarasin, who have recently explored large portions of the island, regard Lake Posso as filling not a crater but a primitive rift in the earth's surface. The climate is unusually healthy. Gold is found, and sulphur is plentiful in Minahassa. Coal (lignite) is mined in the E. and N.E. of Macassar. The fauna presents several points of interest, certain districts having their own peculiar species. Trade is chiefly confined to the ports of Vlaardingen or Macassar, Menado, and Kema in Minahassa. The people are mostly Malays, Buginese, and, in the interior, Indonesians. The total area is about 70,000 sq. m. Pop. estimated (1900) at 1,870,000.

The Dutch established factories on the island shortly after the middle of the 17th century, and have retained possession of it ever since.



Celebes Sea, the division of the Pacific which lies between Celebes, Borneo, and the Philippines, in the E. Indies. It has been sounded to a depth of 13,040 ft.

Celery (*Apium graveolens*) is a native umbelliferous plant occurring wild in the temperate countries of Asia and Europe, in moist places, usually by the sea. The plant is hardy and is extensively grown in the United States and Canada for its blanched leaf stalks. These are eaten raw chiefly, but also cooked as a vegetable and used for seasoning soups and salads. Deep, loose, fertile soils, especially reclaimed muck lands, produce the greatest yield of celery, though the best quality is grown on loamy uplands. The seed is started in hot-beds, seed-bed or window boxes, and preferably transplanted once before setting in the field. In the field the plants are set in rows 4 to 5 ft. apart and about 8 inches distant in the row. Frequent shallow cultivation is given until the plants are about 10 inches high. The earth is then drawn up with a hoe and packed around the plants in such a way as to form a close, compact bunch. As the plants continue growth more earth is drawn up around them, leaving only the tips of the leaves exposed. The earth excludes the light, and the new growth of the celery is thus blanched, crisp and of improved flavor. Other materials like boards, drain tiles set over the plants, or papers wrapped around them, are used for blanching. By one system of culture the plants are set so close together (8x12 inches apart) that they exclude the light, and it is only required to set up boards or bank up the outer rows in blanching. Such close planting requires very rich soil, thorough culture, heavy fertilizing, an abundance of water, and special varieties of celery to succeed. Well-rotted barnyard manure and wood ashes are amongst the best fertilizers for celery, and the ground can scarcely be made too rich with these materials. Celery intended for winter use may be stored in late fall either in trenches outdoors or in a cool cellar. When stored in trenches out-doors the trenches are dug 8 to 10 inches wide and deep enough so that the celery with the roots on may stand upright in the trench. The roots are covered with soil, but none put between the plants, which are packed in tight. The tops are covered with straw or other material, and as freezing weather comes on soil is added.

Golden Self-Blanching is one of the most popular varieties of celery and is especially valuable in intensive culture where self-blanching is sought. White Plume is also excellent and somewhat more resistant to bacterial disease. One of the largest varieties is Giant Pascal. Of the various diseases which affect celery nearly all can be controlled by the use of standard fungicides like Bordeaux Mixture.

Céleste, Madame (?1814–82), French actress, born in Paris. She came to the U. S. when quite young, and made her début at the Bowery Theatre, New York (1827), afterward playing with much success in Philadelphia. Her first appearance in London was at the Queen's Theatre, as an Arab boy in the *French Spy* (1831). After a tour through Italy, Germany, Spain, and Scotland, she returned to London (1833), appearing at Covent Garden in the *Maid of Cashmere*, succeeded by a season at Drury Lane. She paid a second visit to the United States (1834–7). Her next venture was the management of the Adelphi, London (1844), where she created her most famous rôle, Miami, in *Green Bushes* (1845), and in 1859 became manager of the Lyceum. She again visited the U. S. in 1865-68. She retired in 1874.

Celestina, celebrated Spanish comedy (1502; new ed. 1900), is properly a dramatized novel. It appeared in English translation in 1631, and was reprinted in 1874 by Dodsley in *A Select Collection of Old English Plays*. Although the author or authors were long unknown, it is now accepted that the first act was written by the poet Rodrigo de Cota about 1480, and that Fernando de Rojas wrote the rest about 1490.

Celestine, or Celestinus, the title of five Popes: I. (422–432), II. (1143–4), III. (1191–8), IV. (1241–died sixteen days after his election), V. (1294). Under Celestine I. St. Palladius and St. Patrick were sent to Ireland. Celestine V. was the founder of the orders of the Celestine Monks and the Celestine Hermits.

Celestines, a branch of the Benedictine order who practised special austerities. Founded by Pietro da Murrone (1254), they were known as Murronites until his elevation (1294) to the papacy as Celestine V. The Celestine houses were numerous in Germany till the reformation, and in France till 1766. Few now survive even in Italy. The Celestine Hermits, an offshoot of the Franciscan order, due to the same founder, had but a short existence. See Heimbucher's *Orden und Kongregationen* (1896–7).

Celestite, a mineral consisting of sulphate of strontium, and belonging to the same group as barytes. It crystallizes in the ortho-rhombic system in crystals often long, columnar, and pointed. It has a good cleavage, and a hardness of 3½; and when a fragment is heated in the forceps before the blowpipe, the flame is colored scarlet red—a characteristic reaction of minerals containing strontium. Celestite is colorless, white, or bluish, the occasional sky-blue color being the source of the name. Although not one of the commonest minerals, it is by no means rare, and finds a limited commercial employment as a source of strontium compounds and in the refinement of sugar.

Celibacy, abstention from the married state by men, as a social and secular phenomenon, depends on the distribution of population according to age and sex and economic conditions. It has sometimes been regarded with disfavor, especially in countries where there is compulsory military service. The decadence of certain countries—*e.g.* Spain—has been attributed to the fact that a large proportion of the men live as celibates, and some critics—*e.g.* Galton—have claimed that the choice of the celibate life by the better members of society has, by the laws of heredity, reduced the quality of succeeding generations.

As a religious observance celibacy has held a prominent place in two world religions—Buddhism and Christianity. The instance of the vestal virgins of Rome is not typical of the religious practice of the ancient world. Religion was so much a family and a national concern, that celibacy found little place in its observance. Usually in the case of national religions a family or tribe was set aside as a perpetual priesthood—*e.g.* the tribe of Levi—and although continence was frequently prescribed during the period of exercising the priestly duties, celibacy was not prescribed. There is no trace in the Old Testament of any desire to exalt celibacy; and although among New Testament writers—*e.g.* St. Paul—chastity and virginity are regarded as the more excellent way, compulsory celibacy is not insisted on. The earliest Christian celibates were not ecclesiastics, but hermits and anchorites, and only gradually was celibacy enjoined upon the active clergy. The law of celibacy has never been accepted by the Eastern or Greek Church; and Rome itself, in the United Greek Church, tolerates a married clergy, although no married priest can become a bishop. At the first Council of Nicæa (325 A.D.) an unsuccessful attempt was made to impose celibacy as a law on the church. Thenceforward the development of the idea is in the Western Church only. But the practice was not uniform, the rural clergy resisting the attempt to impose it obligatorily on them. Gregory VII. was powerful enough to secure a much more strict observance, and after the first and second Lateran Councils (1123 and 1139) clerical marriages were regarded as invalid. Since the Council of Trent, in 1563, pronounced for celibacy in the strongest manner, it has been strictly enforced as a law and obligation. In the ritualistic movement in the Church of England and the Protestant Episcopal Church in the United States, celibacy has been praised as a virtue and claimed as a duty by some advocates, but it has not, of course, been enforced as an obligation of the church. See H. C. Lea's *Historical Sketch of Sacerdotal Celibacy* (1886).

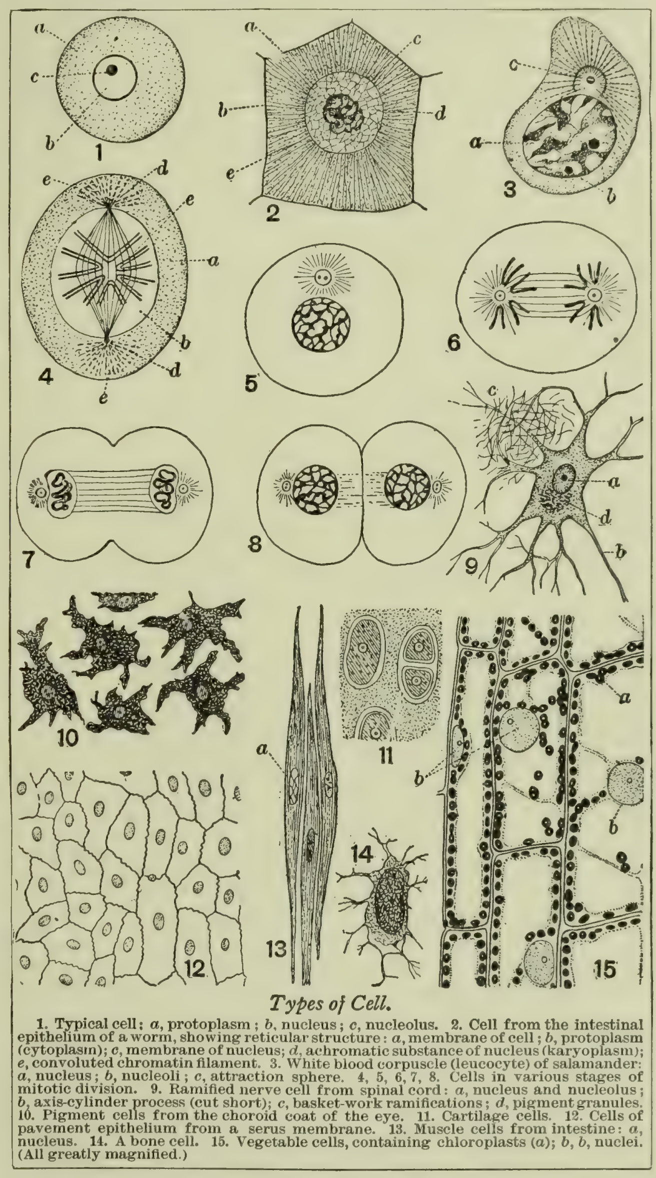
Celina, vil., O., co. seat of Mercer co., 92 m. w.n.w. of Columbus, on the Grand Reservoir, and on the C., H. and D., the Cin., N., and the Lake Erie and W. R. Rs. It has iron works, canneries and brickyards. Pop. (1910) 3,493.

Cell is a mass of protoplasm containing a nucleus, both nucleus and protoplasm having arisen through the division of the corresponding elements of a pre-existing cell. A typical cell is spherical in form; but this shape is rarely retained in multicellular animals, where the cells are usually subjected to pressure, except in the case of egg cells. In spherical cells the nucleus occupies an approximately central position. Structurally, this nucleus is to be regarded as a specialized portion of the protoplasm, and it is therefore convenient to use the term protoplasm to designate both the substance making up the cell body and that constituting the nucleus, the terms cytoplasm and karyoplasm being employed respectively for these two forms of protoplasm. In addition, in many cells a minute body called the centrosome also exists; but it is still doubtful whether this persists from generation to generation as the nucleus does. The cytoplasm has a complex structure, and it is possible that the structure not only varies in different cells, but also in the same cell at different times. It is frequently possible to make out in the cytoplasm a network, or reticulum, made of a substance slightly denser than that which fills the spaces of the reticulum. Along the meshes of the net granules, or microsomes, are often scattered.

The nucleus, without which the cytoplasm is incapable of continued existence, is separated from the surrounding cytoplasm by a nuclear membrane, and is also of a complicated structure, but differs markedly from the cytoplasm. It exhibits an irregular reticulum composed of two different elements—first, of a substance called linine, apparently related to cytoplasm; and second, of the exceedingly important substance called chromatine. This stains very darkly with many dye-stuffs, whence its name, and its importance is shown by the fact that it is handed on from generation to generation. It contains a large amount of a phosphorus-containing substance called nucleine. Within the nucleus there are often bodies called nucleoli, which may be made of an aggregation of chromatine, or may be plasmosomes ('true nucleoli'), whose nature and function are not well known. Finally, the meshes of the nuclear reticulum are filled up by what is known as nuclear sap.

The third important element of the cell is the centrosome, a minute body, either double or single, which stains intensely with the dye hæmotoxyline, and is surrounded by an 'attraction sphere,' or by a radiating aster. Only discovered in 1875, the centrosome is still inadequately known. It has been regarded as the centre of force in the cell, and is of great importance in cell division.

In many plant cells other cell organs exist in the form of plastids, which, like the nucleus, are capable of growth and division, and are handed on from generation to generation. The most important of these are the chloro-plastids, or chlorophyll corpuscles, and the starch-forming leuco-plastids. As a rule, the cell membrane, or cell wall, is only slightly developed in animal cells, but it is often thick and highly important in the cells of plants, where it is formed of the carbohydrate cellulose.



Types of Cell.

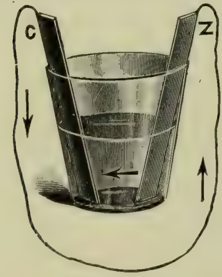
1. Typical cell; *a*, protoplasm; *b*, nucleus; *c*, nucleolus. 2. Cell from the intestinal epithelium of a worm, showing reticular structure: *a*, membrane of cell; *b*, protoplasm (cytoplasm); *c*, membrane of nucleus; *d*, achromatic substance of nucleus (karyoplasm); *e*, convoluted chromatin filament. 3. White blood corpuscle (leucocyte) of salamander: *a*, nucleus; *b*, nucleoli; *c*, attraction sphere. 4, 5, 6, 7, 8. Cells in various stages of mitotic division. 9. Ramified nerve cell from spinal cord: *a*, nucleus and nucleolus; *b*, axis-cylinder process (cut short); *c*, basket-work ramifications; *d*, pigment granules. 10. Pigment cells from the choroïd coat of the eye. 11. Cartilage cells. 12. Cells of pavement epithelium from a serus membrane. 13. Muscle cells from intestine: *a*, nucleus. 14. A bone cell. 15. Vegetable cells, containing chloroplasts (*a*); *b*, *b*, nuclei. (All greatly magnified.)

When cells have reached their limit of growth division takes place, the process, in the majority of cases, being of an exceedingly complicated nature. In a cell about to divide the nuclear membrane disappears, the chromatine increases in staining power, and takes on the form of a stout coiled thread. This thread, or skein, breaks up into loops, and the loops form a central star. Meanwhile the centrosome has divided into two, and these two take up positions at the poles of the cell, each being surrounded by a radiating aster. From one centrosome to another there run fine non-staining (achromatine) threads, which constitute the nuclear spindle. On these achromatine threads the chromosomes, or loops of chromatine, lie, and each splits into two. The halves then separate from one another, travelling along the achromatine threads to the poles of the cell, so that, in place of the original central aster, two daughter asters arise, one at each pole. From these daughter asters nuclei are constituted, the cytoplasm divides, and the cell division is complete. To the whole process the name of karyokinesis, or mitotic division, is given. In a few cases—*e.g.* in many Protozoa—cells divide directly, without any karyokinetic process, the parent nucleus becoming constricted in the centre so as to form two new nuclei. The object of the ordinary karyokinetic process appears to be to produce an accurate division of the parent chromatine between the two new nuclei.

As previously indicated, the cells which are usually taken as typical are the sex cells, which are easily obtained free. The cells which constitute the tissues of multicellular animals differ markedly from such typical cells, the differences depending upon their adaptation to serve special functions. Thus, a striped muscle fibre is a greatly elongated cell, made up of a number of slender longitudinal fibrils, marked with stripes, or alternating bands of light and dark substance; and a nerve cell may have many elongated processes extending outwards from the cell body. In the Protozoa the single cell performs all the animal functions, but in the Metazoa there is much histological division of labor, and this is reflected in the structure of the cells.

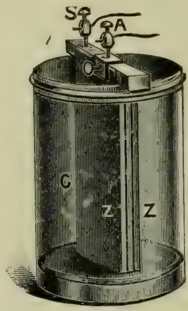
For a general description of the cells of the Metazoa, see a textbook of histology, such as Prudden's *Handbook* (1901); and for a very full account of the problems connected with the cell and with cell theory, see E. B. Wilson's *The Cell in Development and Inheritance* (2nd ed. 1900).

Cell, VOLTAIC, or PRIMARY BATTERY. A voltaic cell is any combination of metallic and liquid conductors capable of supplying a steady current in a circuit of which it forms a part. In all cases chemical action is the source of the energy. A good voltaic cell should be of high and, as far as possible, of constant electro-motive force; should be free from polarization, and of low internal resistance; should be quiescent on open circuit; should give off no fumes when in action; should be cheap, durable, not liable to rapid exhaustion, and easily renewed. No single cell meets all these requirements. For an ordinary commercial purpose, however, tolerable efficiency in one or two particulars is generally sufficient. The different kinds of cells in use fall into a few well-defined classes, the chief differences being in the various devices adopted to obviate polarization.



Simple Cell.

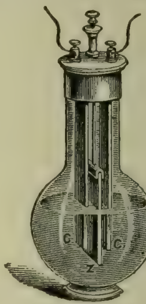
The Simple Cell.—A plate of copper c and a plate of zinc z dipping into a beaker which contains dilute sulphuric acid (about twenty parts by volume of water to one of acid) constitutes a simple voltaic cell. The electro-motive force of such a cell is 1.05 volts. As soon as circuit is made, zinc replaces the hydrogen in the sulphuric acid, and hydrogen bubbles are evolved at the surface of the copper plate. This produces what is known as electrolytic polarization, and the current falls off. The great problem for the electrician is how to dispose of this hydrogen, and, broadly speaking, the working efficiency of any cell depends upon the extent to which this is done.



Smee's Cell.

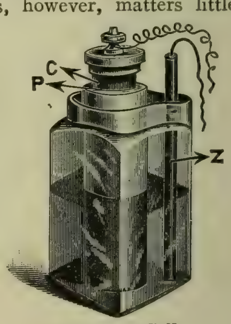
Smee's Cell.—In this type dilute sulphuric acid is again the exciting fluid. A zinc plate z forms the negative pole, but the copper plate is replaced by one of platinized silver—*i.e.* by a silver plate whose surface is roughened by being coated with finely-divided platinum. As the hydrogen collects here in minute bubbles, it detaches itself from the fine points, and, rising through the liquid, bubbles off. The device is only moderately successful, much of the gas continuing to adhere to the plate.

Bichromate of Potash Cell.—In this case bichromate of potash is the depolarizer employed. The excitant is again dilute sulphuric acid, in which the bichromate is dissolved. The plates are of carbon and zinc, generally two carbon plates with the zinc between, the carbons being joined outside the liquid by a metal strip. As the solution would attack the zinc, this plate can be raised out of the liquid when the cell it not in action. This cell has the high electro-motive force of 2.1 volts and a low internal resistance. If employed to send a strong current for some time, the E.M.F. falls off, for the liquid in contact with the carbon has been used up; but the cell recovers on standing inactive, or on being stirred.



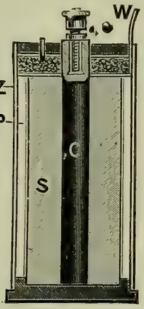
Bichromate Cell.

Leclanché Cell.—This is the cell most extensively used in bell circuits. It commonly consists of a glass vessel containing a saturated solution of sal-ammoniac (ammonium chloride) and a zinc rod z or hollow cylinder. A porous pot of unglazed porcelain p occupies the centre of the cell, and holds a carbon plate c tightly packed round with small lumps of crushed carbon and black oxide of manganese (manganese dioxide). Diffusing through the porous pot, the sal-ammoniac moistens the powdered carbon and manganese dioxide, and thus enables the currrent to pass. The cell is clean, cheap, easily renewed, contains no corrosive acids, and emits no fumes. The E.M.F. is about 1.4 volts. In action the black oxide of manganese oxidizes the evolved hydrogen, but only somewhat slowly. Hence polarization soon occurs. This, however, matters little in bell work, where the current is kept running only for a very short time and at intervals. An important modification of this cell



Leclanché Cell.

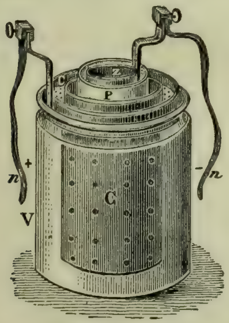
is the agglomerate Leclanché, in which the internal resistance is lessened by dispensing with the porous pot. Powdered carbon, manganese dioxide, and gum-lac resin, intimately mixed in the proportions of 40 parts of manganese dioxide, 55 parts of carbon, and 5 parts of resin, are pressed into rectangualr blocks, which are held up against the sides of the carbon rod by india-rubber bands.



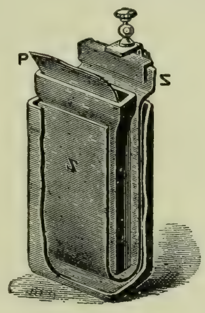
Dry Cell.

Dry Cells.—A popular form consists of a cardboard cylinder containing a zinc cylinder Z with wire W attached. This is lined with a paste P made of plaster of Paris 27 parts, water 51 parts, and sal-ammoniac 12 parts. A carbon rod C is then put in the centre, and the remaining space S filled up with a mixture of sal-ammoniac, powdered carbon, manganese dioxide, zinc sulphate, and glycerine, made into a paste with water. On standing, the paste hardens into a firm, gluelike mass. The cell may be used for all purposes for which the Leclanché is suited, and it possesses the advantages of having no liquid to spill or leak away, and of working equally well in any position.

Daniell's Cell.—The Daniell belongs to the important class known as two-fluid cells, in which depolarization is effected by electro-chemical means. The members of this class are, as a rule, much more constant than the single-fluid cells, because the polarizing hydrogen is not allowed to form on the positive pole. The essential parts of the Daniell cell are a zinc rod immersed in dilute sulphuric acid, or zinc sulphate solution, and separated by a porous pot of unglazed earthenware from a copper plate dipping into a solution of copper sulphate. The copper-sulphate solution must be kept saturated. This is effected by having in the solution a supply of copper-sulphate crystals, which, as the solution becomes weaker, gradually dissolve in the liquid and restore its strength. If the cell is not required for immediate use, water may be placed in the porous pot, and the cell short-circuited, until sufficient sulphate of zinc is formed. When the cell is in action, the sulphuric acid attacks the zinc, forming zinc sulphate and liberating hydrogen. The molecules of hydrogen traverse the pores of the porous pot and continue into the outer cell, where the hydrogen combines with the copper sulphate, forming sulphuric acid, and depositing pure copper on the copper pole. The hydrogen thus never reaches the copper plate. The chemical reaction consists essentially in the replacement of copper by zinc in the solution. If zinc sulphate is used instead of sulphuric acid, the resistance is considerably higher, but the action is similar. Though the E.M.F. of the Daniell is only about 1.08 volt, it is more constant than that of any other cell in common use. On this account the cell is well fitted to serve as a standard of electro-motive force. In the gravity cell the porous cup is dispensed with and the zinc often cast in the form of a 'crow foot' is suspended in a solution of sulphate of zinc, which, by virtue of its lower specific gravity, rests above the sulphate of copper solution.



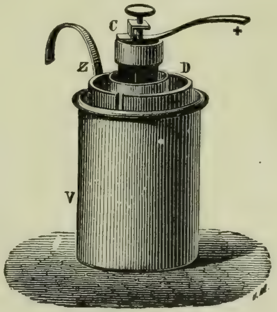
Daniell's Cell.



Grove's Cell.

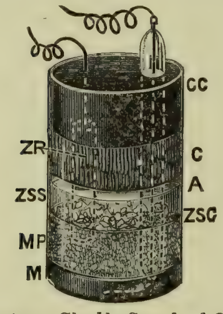
Grove's Cell.—Sir William Grove devised a cell which has both a higher voltage (as much as 1.9 volts) and a lower internal resistance than the Daniell. It differs from the Daniell in having platinum foil immersed in concentrated nitric acid instead of copper in copper sulphate. The hydrogen liberated by the solution of the zinc in the sulphuric acid, passing through the depolarizing nitric acid towards the platinum, decomposes the nitric acid, and is itself oxidized, forming water and nitrogen peroxide gas. This gas appears in the form of red fumes in the inner pot; but it causes no polarization, for being very soluble in nitric acid, it does not attach itself to the platinum, nor does it set up a counter E.M.F. A Grove will send a current continuously for several hours without exhaustion. One cell will raise a few inches of platinum wire to red heat; fifty quart cells in series will produce an electric arc light.

Bunsen's Cell.—This is merely a modification of the Grove cell in a cheaper form, the expensive platinum plate being superseded by a rod of carbon. The internal resistance and the voltage are practically the same as in the Grove's cell; and the chemical action is also similar, the evolved hydrogen decomposing the nitric acid and uniting with part of its oxygen to form water, dark-red nitrogen peroxide fumes being given off. Like the Grove, too, the cell may be kept in action several hours without polarizing appreciably, but care should be taken not to inhale the fumes. In view of its constancy, cheapness, and high E.M.F., the Bunsen is, on the whole, perhaps the best cell for general experimental work where a steady E.M.F. and large current are required.



Bunsen's Cell.

Latimer Clark's Standard Cell.—To secure the greatest possible accuracy in the measurement of electro-motive force, it is desirable to use the Latimer Clark cell, now adopted as the international standard of E.M.F. Its construction is complicated and difficult, and need only be attempted by experts. A quantity of pure mercury M occupies the bottom of the cell, and is covered by a layer of paste of mercurous sulphate MP. Above this comes a saturated solution of zinc sulphate ZSS into which a zinc rod ZR dips. Above the solution we have a layer of paraffined cork C to prevent evaporation, and over all a layer of cement CC. A represents an air space, and ZSC a supply of zinc-sulphate crystals. Contact is made with the mercury by a platinum wire enclosed in a glass tube which is hermetically sealed. When the cell has been set up for some time its voltage is remarkably constant, standing at 1.434 volts at 15° C. In use the cell must not be short-circuited, as it then polarizes rapidly. Its voltage varies also with the temperature.



Latimer Clark's Standard Cell.

Weston Cell.—Another important standard cell is the Weston, in which the zinc and zinc sulphate of the Latimer Clark cell are replaced by cadmium and cadmium sulphate. A cadmium amalgam, consisting of metallic cadmium and mercury, forms the negative electrode of this cell, and above it is a solution of cadmium sulphate, and in some cases cadmium sulphate crystals. The other electrode consists of metallic mercury, covered by a paste of mercurous sulphate, the whole being hermetically sealed by cork and paraffine. This cell has an electro-motive force of about one volt, at 20° C., being said to have an electro-motive force of 1.0192 volts.

For arrangements of batteries, see Ohm's Law, Electricity, Current, Accumulator. See H. S. Carhart's *Primary Batteries* (1891); W. R. Cooper's *Primary Batteries* (1901); Silvanus Thompson's *Elementary Lessons in Magnetism and Electricity* (1900); Poyser's *Magnetism and Electricity* (1892); Jamieson's *Elementary Manual of Magnetism and Electricity* (4th ed. 1897).

Cellarius, properly Kellar, Christoph (1638-1707), German humanist and pedagogue, born at Schmalkalden; after teaching for twenty-six years, was appointed (1693) professor of rhetoric at the newly-founded university at Halle. Cellarius contributed much to the revival of classical studies in Germany. Among his books are *Antibarbarus Latinus* (1677), *Orthographia Latina* (1700), *Historia Antiqua* (1685), *Historia Medii Ævi* (1688), *Historia Nova* (1696), also *Geographia Antiqua* and *Geog. Nova* (1686 and 1687). His *Dissertationes Academicæ*, with Biography, were published in 1712. See Kiel's *De Ch. Celarii Vita et Studiis* (1875).

Celle, formerly also Zelle, tn., prov. Hanover, Prussia, on the S. margin of the Lüneburg Heath, 23 m. by rail N.E. of Hanover. The parish church contains the tombs of the ducal family of Brunswick-Lüneburg, including that of Sophie Dorothea, the divorced wife of George I. of England. In the castle park is the mausoleum of Caroline Matilda, queen of Denmark and sister of George III. of England. Various industries. Pop. (1900) 19,883.

Cellier, Alfred (1844-91), English musical composer, born in London, of French parentage. He conducted in Prince's Theatre, Manchester (1871-5), at the Opéra Comique, Manchester (1876), and the Opéra Comique, London (1877-9). His easy style and agreeable flow of melody are strongly in evidence in the *Sultan of Mocha* (1874), though less suited for his more serious setting to Gray's *Elegy* (Leeds Festival, 1883). His other works are: *Charity begins at Home* (1870), Longfellow's *Masque of Pandora* (1881), *Tower of London* (1875), *The Spectre Knight* (1878), *The Carp* (1886), *Mrs. Jarramie's Genie* (1888), and *Doris* (1889), besides music adapted to the librettos *Dorothy* and *Mountebanks.*

Cellini, Benvenuto (1500-71), the greatest of the Italian artificers in gold during the renaissance; born in Florence. This complex personality—goldsmith, sculptor, warrior, braggart, and author—has left in his *Autobiography* (1728) a graphic picture of his day, with its vivid contrasts of skilled genius and barbarism. His youth was a series of violent escapades, flights from justice alternating with intervals of admirable workmanship. Finally he settled in Rome under papal patronage, and made numberless works of art, from elaborrate silver vases for cardinals, and statuettes, to coinage dies for Clement VII.; while, for the same pope, he defended the castle of San Angelo against the besieging Bourbon troops (1527). Later he spent some time (1540-5) in Paris, and made a basin and ewer in silver-gilt repoussé; the colossal bronze relief, *The Nymph of Fontainebleau,* now in the Louvre; and the fine golden salt-cellar now in Vienna. His one large bronze statue of Perseus, in Florence, made for the Grand-Duke Cosmo de'Medici, is technically a triumph; though, artistically, the bronze portrait of Bindo Altoviti, so much admired by Michael Angelo, is finer. For translation of his *Autobiography,* see *Life of Benvenuto Cellini* by J. A. Symonds (new ed. 1901); also *Lives* by Tassi (1847) and Mollinier (1894), and F. S. Potter's *A Wonderful Goldsmith* (1882), also Scott's *Sculpture, Renaissance, and Modern* (1886).

'Cello, contraction of violoncello. See Violin.

Cells. As to the part the different classes of cells play in the structure and functions of the animal body, and theories involved, see Biology.

Cellulitis is inflammation of the loose cellular connective tissue of the body, either starting in the cellular tissue itself, or spreading to it from other tissues. It may be acute or chronic, circumscribed or diffuse. It may end in suppuration, in resolution or in the formation of fibrous adhesions. Owing to the comparatively low vitality of connective tissue, suppuration is common. Cellulitis must be distinguished from erysipelas, which is caused by a specific organism. Whereas erysipelas begins with a redness of the skin, with well-defined limits, cellulitis, on the other hand, is present for some time before the skin becomes much affected, the resulting blush is not so bright, and it tends to be ill-defined about its circumference. When suppuration occurs, it may, of course, implicate important structures burrowing into any adjacent organ, or disorganizing a joint, or causing death by general septic infection. Preventive treatment consists of the antisepsis of every wound or abrasion, however small, and particularly when any poison may be present, as in a sting or bite. In the early stages of cellulitis it is well to ensure the free action of the bowels. Pain is treated with anodynes, and locally by hot fomentations. If suppuration ensue, there must be free incisions made, to ensure the escape of pus, this being aided by warm antiseptic applications. Diet must be nutritious and easily digestible, and stimulants may be necessary.

Celluloid, or Xylonite, consists essentially of a solid solution of the lower nitrates of cellulose in camphor. The cellulose, in the form of bleached cotton or tissue paper, is immersed in a mixture of certain proportion of nitric and sulphuric acids to form nitrocellulose or pyroxylin.

After nitration is complete (thirty minutes or more), the product is washed to remove the acid or, more commonly, transferred to an hydraulic press or hydro-extractor in order that the acids may be recovered for further use. The next step in the process is *bleaching.* To accomplish this, the cellulose is reduced to a pulp and treated with a solution of potassium permanganate acidified by the addition of sulphuric acid. After a variable period (three to twelve hours), the bleaching liquid is run off from the vats, and the pulp is washed and then treated with sulphur dioxide (gaseous) to precipitate the remaining potassium permanganate, again washed to remove every trace of acid, and again hydro-extracted. Bleaching by hypochlorite is also practised. The bleached nitrocellulose is now thoroughly dried, usually in a drying press, after which it is ready to be made into celluloid.

In America the cakes from the drying press are ground and mixed in special mills with pulverized camphor, the moisture is expressed by hydraulic pressure, and the resulting product is rolled in a rolling mill, at a temperature of about 65° C. The nitrocellulose is thus dissolved in the melted camphor, and celluloid is produced. This is known as the 'dry process.' In the 'wet process' the nitrocellulose (50 parts) is put in vessels of stoneware and treated with a solution of camphor in ether and alcohol. The resulting mixture is rolled into sheets, hardened, and treated in the hydraulic press. Cutting, drying, dressing, and polishing complete the process.

Crude celluloid is a nearly colorless substance, transparent to translucent, and with a specific gravity of 1.25 to 1.45. It is insoluble in water and has considerable tensile strength. When heated to 90 to 125° C. it becomes plastic and is easily moulded. At this temperature, also, separate pieces can be welded together by simple pressure. It can be ignited only by a naked light, burning with a smoky flame. At 195° it decomposes instantly. It can be cemented to wood, leather, and other substances by collodion or a solution of shellac and camphor in alcohol.

Celluloid finds a wide range of application in manufacturing industries. It is used for combs, toys, and toilet articles; in the manufacture of lacquers; for dental appliances and optical instruments; in machinery for emery discs, packing rings, tubes, valves, etc.; for printing blocks and stamps; for beads and buttons; for phonograph records; for photographic plates and films; and in solution, as a coating for aeroplane wings.

Consult books listed under CELLULOSE; also Masselon, Roberts, and Allard's *Celluloid* (Eng. trans. by Hodgson, 1912) and Böckmann's *Celluloid* (2d Eng. ed., by H. B. Stocks, 1921).

Cel′lulose is the chief component of all vegetable tissues, in which it exists in elongated cells or fibres, and represents the result of the plant's activity in building up its structure from the elements of carbon dioxide and water. In composition it is a carbohydrate $(C_6H_{10}O_5)^n$, with the same empirical formula as starch and dextrin, from both of which, however, it differs materially in its properties. Cotton-wool and filter-paper are almost pure cellulose, from which it may be seen that it is a white, opaque solid, odorless and tasteless, appearing under the microscope to consist of thin, flattened tubes. It is insoluble in water, but is soluble in a concentrated solution of zinc chloride, a property which finds application in the manufacture of vulcanized fibre; in an ammoniacal solution of cuprous oxide, from which it may be re-precipitated by neutralization with an acid; and in alkaline thiocarbonates, forming a solution known as viscose, extensively used in the manufacture of artificial silk (see SILK). When treated with strong solutions of caustic soda, cellulose swells and contracts, the hollow fibres being transformed into solid filaments, a phenomenon which is made use of in the process of 'mercerizing' (see MERCERIZATION).

Perseus (in bronze)
made by Benvenuto Cellini for the Grand Duke Cosmo de' Medici

Moderately concentrated acids toughen and parchmentize cellulose, but in a more concentrated form they yield esters, of which the most important are the nitrates, employed commercially as pyroxylin and gun-cotton (qq. v.). The cellulose acetates (acetyl cellulose) are also of commercial importance, being extensively used in the manufacture of non-inflammable celluloid substitutes, as 'cellite,' and artificial silk (the so-called 'acetate silk'). Besides the applications of its derivatives, cellulose is employed in enormous quantities in the fibrous state in the form of cotton, linen, jute, hemp, etc., to make textiles, and in the state of pulp, obtained chiefly from wood and esparto, to make paper. Consult Cross and Bevan's *Cellulose;* Schwalbe's *Chemie der Cellulose;* Worden's *Technology of the Cellulose Esters* (10 vols.); Martin's *Industrial and Manufacturing Chemistry* (5th ed., 1920).

Celman, MIGUEL JUAREZ. See JUAREZ-CELMAN, MIGUEL.

Celo′sia, a popular garden annual belonging to the order Amarantaceæ. There are about 35 species, all tropical. The leaves are entire, sometimes lobed, and the flowers grow in dense terminal or axillary spikes. There are two main types of celosia, the crested and the plumy. *C. cristata,* popularly known as Cockscomb, is the best known example of the crested type. It grows to a height of nine or more inches and bears beautiful red, violet, crimson, or yellow flowers. *C. argentea* and *C. Huttoni* are examples of the plumy type and are largely grown for decorative purposes.

Cel′sius, ANDERS (1701–44), Swedish astronomer and mathematician, was born in Upsala, and from 1730 to 1744 was professor of astronomy in the University there. He was commissioned by the Swedish government to visit the chief European observatories, and accompanied Maupertuis, Clairaut, and the other French savants, in 1736, on their famous expedition to Lapland to measure a degree of meridian. He wrote numerous and important works on astronomy, but is remembered chiefly as the inventor of the centigrade thermometer (see THERMOMETER). In his scale, however, the numeration ran downward instead of upward, as in the modern centigrade scale. In 1740 Celsius built the observatory of Upsala, and became its director.

Celsius, OLOF VON (1716–94), Swedish historian and poet, was born in Upsala. In 1744 he became assistant librarian at the University of Upsala, and in 1747 professor of history there. He was called as pastor to Stockholm in 1753, and in 1777 became bishop of Lund. Celsius was a member of the Academy from its foundation (1786). His historical works are especially noteworthy for the thoroughness of their criticism and the brilliancy of their style. The best known are *Konung Gustaf I.'s Historia* (2 vols. 1746–53) and *Konung Erik XIV.'s Historia* (1795). He began an ecclesiastical history of Sweden (*Svea Rikes Kyrkohistoria*), but finished (1767) only the first volume (down to 1022).

Cel′sus, an Epicurean philosopher who flourished in the second century. He is supposed to have been a native of Rome, and was a friend of Lucian. He is credited with the authorship of an attack on Christianity called *Logos Alethes* ('True Discourse'), which is not extant, but which was confuted by Origen in his treatise *Contra Celsum.*

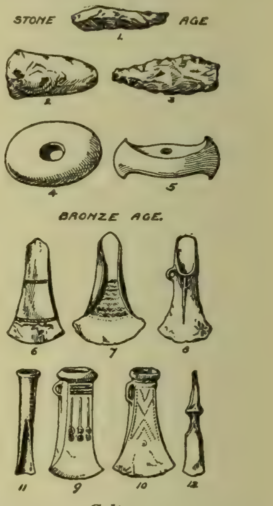
Celsus, AULUS or AURELIUS CORNELIUS, a Latin writer on medicine. His work, in eight books, contains a discussion of the history of medicine; remarks on diet and the general principles of therapeutics, with the consideration of the treatment of the various diseases, the method advised being largely to allow nature to effect the cure, though the author also recommends a free use of the lancet on occasions; an account of surgery, which shows that many of the most serious operations were practised; and finally a pharmacopœia, containing many excellent prescriptions. There are editions by Ritter (1840) and Daremberg (1859) and an English translation with Life by A. Lee (1831–6).

Celt, a now discarded term for the stone and bronze axes and chisels of prehistoric times. Stone axes present endless varieties of form, the extremes being those which have a cylindrical, pointed butt end, and those that are perfectly flat and thin. They vary in length from less than two inches to nearly sixteen inches, and in degree of finish from roughly chipped forms to specimens possessing the highest possible polish. Stone chisels are rare. Bronze axes comprise (*a*) the flat axe, which is the earliest form; (*b*) the flanged, frequently ornamented with punched designs; and (*c*) the socketed axe. Chisels of bronze are extremely rare.

Celtiberi, sel-ti-bē′rī, a people of ancient Spain, descended from Celts who at an early period invaded the Spanish peninsula and intermarried with the Iberians, the primitive inhabitants of the country. They dwelt in the mountainous country in the north and east. The Celtiberi became subjects of Rome in the second Punic War, but frequently rebelled. Scipio the younger reduced them to submission after the fall of Numantia, in 134 B.C.; but they rebelled again under Sertorius, and only after his death, in 72 B.C., were definitely subdued and Romanized.

Celts, or KELTS, a name applied in early history to the peoples who lived in the west and north of Europe, regardless of precise limits or origin. At the height of their power they extended from the north of Scotland to the southern shores of Spain and Portugal, and from the northern coasts of Germany as far south as Rome. The Atlantic bounded their territory on the west, the Black Sea on the east.

With their powerful frames and heavy swords, the Celts were dangerous fighters in the attack; but their lack of cohesion and discipline rendered them incapable of resisting determined opposition. Their raids were the terror of the ancient world, and only the victories of Cæsar and the administration of Augustus reduced them to inactivity. They never founded a lasting state, and although at an early date they began to live in towns, there were only slight bonds of union between individual communities. The Celts of Gaul and Britain became rapidly Romanized after their conquest, and Celtdom soon collapsed.



Celts

1. Flint chisel. 2, 3. Roughly worked flint implements. 4, 5. Finely finished hammer and axe. 6. Flat axe. 7, 8. Flanged axes 9, 10. Socketed axes. 11. Gouge, 12. Chisel.

The Celtic peoples, in so far as they can be identified by the uncertain test of languages, are represented in modern Europe (1) by the Gaelic-speaking communities of some parts of Ireland, the Scottish Highlands and

Islands, and the Isle of Man, and (2) by the Cymric-speaking inhabitants of Wales and Brittany. Belonging to this second division, although without such a strong title from the linguistic point of view, are those Cornish people whose near ancestors used a Cymric form of speech. Further, there is presumably a large proportion of Celtic blood in the mixed race forming the population of England, notably to the north of the Trent and throughout the western counties, and in the non-Gaelic-speaking peoples of parts of Scotland and Ireland.

Except for the Bretons, none of the continental peoples has retained a Celtic language. Yet the testimony of history shows that, from the Kalatians in the east to the Gauls and the hybrid Celtiberi in the west, Europe once possessed a large Celtic population. In the days of Pytheas (fourth century B.C.) the Celts inhabited most of the northwest of Europe, and from there came the chief tide of Celtic invasion that swept over the British Isles, subduing the native races, at various periods before the days of Julius Cæsar.

The Celts are described as tall, pale, and fair-haired, their dress consisting of a sleeved blouse, sometimes belted, with trousers fitting close to the ankle—the Highland 'trews' of the eighteenth century. The British Celts encountered by the Romans in the first century B.C. were conspicuous by their tartan clothing, usually red or crimson. They knew how to work such metals as iron, bronze, gold, and tin, and adorned themselves with collars of gold, bracelets, finger-rings, and necklaces of glass beads. The Celts of Gaul and Belgium wore plated armor of bronze and iron, and at other times chain-mail coats; and they, as well as their British kindred, ornamented their armor with enamel. Their weapons were swords, daggers, pikes, bows, javelins, slings, and lassos (similar to the South American bolas); and in battle they employed two-wheeled chariots with a bronze scythe projecting on either side.

The British Celts were stock-breeders and agriculturists, and from their wheat they produced 'metheglin' or honey-beer. So highly advanced were they as seamen that Cæsar, beginning his invasion of Britain, found the combined navy of the Britons and the Bretons much superior to his own. Generally, however, the civilization of the island Celts lagged behind that of their continental brethren, due to the fact that they were colonists. Thus, although those of Britain had long made use of coined money—gold, copper, and (later) silver—they do not seem to have had mints of their own until about 200 B.C. While the Celts of Gaul had well-built cities, their island kindred were living in hamlets and hill forts. It is clear that they practised 'head-hunting,' and preserved the skulls of their enemies as trophies. Their chief religion, Druidism, involved human sacrifice (see Druids).

Language and Literature.—Celtic belongs to the Indo-European group of languages, and in its forms and inflections, so far as they are known directly or can be reconstructed, early Celtic closely resembled Latin and Greek. Its personal names, like the Greek and Teutonic personal names, are all compound terms, usually of two elements, of which one part qualified the other—*e.g.*, Orget-oria, 'king of slayers'; Cinget-oria, 'king of heroes'; Catu-maros, 'great in battle.'

At an early period Celtic discarded the Indo-Germanic *p* sound initially and between vowels. Thus Latin and Greek *pro* became in Celtic *ro;* Lat. *piscis* is Gaelic *iasc;* Latin and Greek *pater* became Gaelic *athair*, 'father'; Welsh *edrydd*, 'patrimony.' At a later but still early period, Celtic divided in the treatment of the Indo-European *qu* sound, certain dialects retaining it; others changing it to *p*. Thus we have a P group and a Q group of Celtic languages. Continental Celtic belonged on the whole to the P group, though there are some traces of retained *qu*—*e.g.*, Sequana, 'the Seine.'

In modern Celtic the two groups are sharply defined: Welsh, Cornish (now extinct), and Breton are of the P group; Gaelic (Scottish and Irish) and Manx are of the Q group, preserving *qu* as *c* or *ch*.

No early Celtic literature has been preserved, though there must have been much bardic poetry and many historical tales among the early Celts (*e.g.*, Livy's account of the golden age of King Ambigatus implies a saga on this subject). The Druids did not commit their learning to writing, and the Bards may have followed their example. Yet by Cæsar's time writing was in vogue among the Gauls, who had come under the influence of Massilian culture. The Helvetii, when they went on their great migration, kept accurate muster rolls in Greek characters. After the Roman conquest, the Gauls of France took readily to learning (as also to agriculture), and even hired professors at the public expense. Cisalpine Gaul supplied some of the greatest Latin writers: Virgil, Catullus, and Livy bear Celtic names, and were probably Gauls. Seneca is also Celtic. The Celts of Britain, after the introduction of Christianity, showed the same desire for learning, and Ireland from the latter part of the eighth century was renowned for its scholars.

See Breton Language and Literature; Gaelic Language and Literature; Wales: *Language and Literature.*

Bibliography.—Consult Rhys' *Celtic Britain;* Rhys and Jones' *Welsh People;* Nicholson's *Keltic Researches;* Rolleston's *Myths and Legends of the Celtic Race* (1911); Shane's *The Celt and the World* (1917).

Cement', any material, whether natural or manufactured, which causes adhesion between two surfaces, or serves as a matrix to combine particles into a whole. Cements may be divided for consideration into three classes: (1) Building Cements, or calcareous cements, which include common lime, hydraulic limes, cement proper (all the hydraulic cements), the gypsum plasters (of which plaster-of-paris is the foundation), and oxychloride cement; (2) Bituminous Cements, made with asphalt, tar, and pitch; (3) Adhesives and Lutes, including a wide variety of mixtures, ranging from ordinary glue and rubber cement to putty and pipe-joint cements.

Building Cements.—The use of some plastic substance to bind together the stones or other materials used in building is exceedingly ancient. The earliest cement was probably nothing more than ordinary mud. The Assyrians used bitumen to cement together the sun-dried bricks which they employed in construction, while the builders of the Great Pyramid made a mortar of burned gypsum. The Romans seem not only to have understood lime mortars and gypsum plasters, but they learned to mix volcanic ashes with burned lime, making what to-day is known as a 'puzzolan cement,' from Puzzoli, whence they obtained their ash.

During the Middle Ages little advance was made in the knowledge of building cements, common lime being used almost exclusively. The modern cement industry dates from the last half of the eighteenth century. John Smeaton (1724–92), in his work on the Eddystone Lighthouse, found that an impure clayey limestone furnished a better mortar than that ordinarily used. The modern Roman cement was developed during the early years of the nineteenth century. Artificial hydraulic cement was first manufactured in France in 1813, and in England in 1822. About 1825 Portland cement was invented.

Lime is calcium oxide, or a mixture of calcium and magnesium oxides, made simply by burning limestone (q. v.) to drive off the carbon dioxide. Lumps of 'quicklime' remain, which may be marketed in this form or, after grinding, slaking in water, and pulverizing, as hydrated lime. For use, quicklime must be slaked by adding water, which converts the oxide into hydroxide. Pure lime becomes very hot in this process, magnesian limes heat only slightly. The hydroxide has the power of absorbing carbon dioxide from the air, thereby changing back to hard carbonate, a property which makes it useful for building purposes. Slaked lime, however, has a tendency to shrink on drying, and to counteract this, sand must be added, the usual proportion being 2 to 4 parts of sand to one of lime paste. This mixture constitutes the lime mortar which has been used since ancient times in laying up brick and stone masonry.

The disadvantages of lime mortar are that the absorption of carbon dioxide goes on very slowly; it cannot proceed at all under water; and the hardened product is of very low strength. Its advantages are its cheapness and its ease of preparation and of use. Lime mortar is credited with a strength of 30 to 50 lbs. per sq. in. after thirty to ninety days' hardening, but it has been found in tearing down very thick walls of considerable age that the innermost mortar was still unhardened, the carbon dioxide not having been able to penetrate to the interior.

Beside its use in building, lime mortar is sometimes used as wall-plaster, for which purpose hair is mixed therein (2 or 3 lbs. per ton of plaster) to give the plaster coat cohesion.

Hydraulic Lime is a lime containing enough silica and clay or magnesia to give it slight hydraulic properties (power of hardening with water alone), though still containing enough free lime to slake and heat when water is first added. These limes, used to some extent in Europe, are indefinite transition stages between ordinary lime and true hydraulic cement. Their hydraulic properties are slight compared either with the good natural cements or Portland cement, and they are little known in the United States.

Hydraulic Cement is a burned and finely ground mixture of lime, clay, and sand, in such proportions that the product, when mixed with water, undergoes a slow hardening by the formation of complex chemical compounds differing from any of the original materials. The most perfect kind is Portland cement, formed by mixing selected materials so as to give a product of definite composition.

Natural Cement is made from limestones which contain considerable impurity in the form of fine clayey matter. It is burned hard enough to cause reaction between the lime and earthy silicate, though not to fusion. This burned material is ground to a fine powder, which is then ready for use. The first cement made in the United States, dating back to 1823, came from near Rosendale, N. Y., where later extensive plants were established. The place has been the centre of this class of cements to the present time. Natural cements are also obtained from the Louisville district of Indiana and Kentucky, Mankato, Minn., the Lehigh region of Pennsylvania, the Fort Scott district of Kansas, and in smaller amounts elsewhere. European natural cements include the natural Portland cements and the Roman cements. (See CEMENT ROCK.)

Portland Cement, because of its great importance, must be considered more in detail. Although it is made from many different kinds of material, as marl, limestone, clay, slag, etc., the mixture resulting is so carefully controlled that almost precisely the same results are produced in all cases. A typical analysis is: 23 per cent. silica, 7½ per cent. alumina, 3 per cent. iron oxide, 2 per cent. magnesia, 62½ per cent. lime, and a trace of sulphur.

The ingredients of Portland cement, typically limestone and clay, are ground together (either wet or dry, depending on whether the raw materials are obtained in dry state or not), and then burned. Formerly they had to be formed into bricks, dried, and then placed in the chambers of vertical kilns, where they were slowly heated by a fire to the temperature of vitrifaction (2,500° to 3,000° F.). Since about 1890, however, the rotary kiln has worked a complete revolution, greatly cheapening the product. The rotary kiln was patented in England by Ransome in 1887, but, after early failure, was brought to practical success in the United States. The kiln, which turns slowly on its own axis, is a long steel cylinder lined with firebrick, from 5 to 15 feet in diameter, and from 60 to 250 ft. in length (80 to 265 for wet mixtures). It is inclined downwards slightly from the chimney, at which end the cement materials, ground to a fine powder, are fed in continuously. At the farther end the fuel, usually pulverized bituminous coal, is blown in by means of a fan or a jet of compressed air, and instantly bursts into violent combustion. The cement, which passes steadily forward owing to the revolution of the kiln, gradually reaches the hot zone, and is converted into clinker. The waste heat serves gradually to raise the cement materials nearly to the clinkering stage, as they approach the hot zone of the cylinder.

The clinker which drops out of the kiln is allowed to cool by weathering or by the employing of some cooling device, and is then conveyed to grinders. Grinding is a most thorough process, as it is necessary to reduce the material to a powder as fine as flour; a finely ground cement will leave not more than 15 to 25 per cent. residue on a sieve of 200 meshes per lineal inch (40,000 per sq. in.). Formerly millstones were used exclusively. Ball mills and tube mills have now come into favor. More recently, grinders having steel gyrators or impact members are being used extensively in America. During the grinding process it is usual to add a small percentage of gypsum or plaster to improve the setting properties. The finished product is stored for a time to age, so that any free lime contained in it may become carbonated.

The time in which a cement sets or becomes hard varies greatly, but it is possible to manipulate a cement by admixture with a small proportion of plaster-of-paris, so as to prolong considerably the interval between the period of gauging (or mixing with water) and the initial set. From twenty minutes up to five or six hours may represent the speed of setting in different samples. Ten hours is the maximum time allowable under government specifications.

In use, cement is mixed with 25 to 30 per cent. of water and one to three times its volume of sand, forming a mortar rather stiffer and less workable than lime mortar. This is used either as mortar, or, mixed with twice to three times its volume of broken stone or gravel, as concrete, the uses of which in engineering construction are manifold (see CONCRETE). For other applications and for the properties of Portland cement see PORTLAND CEMENT.

In the eighties natural cement was still the principal hydraulic cement used in America. In 1919 the production of Portland cement in the United States amounted to 80,777,935 barrels, valued at $138,130,269. The total production of natural and puzzolan cements for the same year was 528,589 barrels, with a value of $583,554. Natural cement is lighter in weight and color, develops only about half the strength, and has less sand-carrying power than Portland. It sets rather more rapidly.

Puzzolan cement is a cement made by mixing raw materials and grinding, but not burning. It is little used in the United States, but considerably in Europe. Many volcanic earths display a slight hydraulic power when ground, and such earths, mixed and ground with quicklime, give a moderately strong cement. In Germany a volcanic rock called 'trass' is largely used for this purpose; trass cement is credited with greater resistance to sea-water than Portland. Santarin rock, obtained in the Grecian Isles, and Pozzuolana, mined in Italy and France, are materials of the same kind. All are chiefly silicates of alumina and iron, with some calcium, etc. Similar materials found in the United States have not yet been exploited. Furnace slags (also vitrified bricks when finely ground) have the same property, being of related composition, and these are used to some extent, both to make puzzolanic cement by grinding with lime, and to make a grade of Portland by mixing, burning, and grinding.

Gypsum Plasters.—Cements made from gypsum rely for their setting properties upon the combination of the sulphate of lime, which is their chief ingredient, with a portion of the water of crystallization, which has been expelled by heat. They include plaster-of-paris (q. v.), cement plaster, flooring plaster, and hard-finish plaster. Plaster-of-paris is made from a comparatively pure gypsum (q. v.). The preparation involves two main operations—grinding and calcining. If the so-called 'kettle process' is used, the gypsum is first finely pulverized in machines made for the purpose, and then charged into cylindrical 'kettles' of from 7 to 12 tons capacity, provided with flues and covered with sheet iron. These kettles are heated to the required degree (340° F.), and the hot material is run off into a fire-proof pit, whence it is screened to remove foreign particles. The calcining process requires from two to three hours. In the 'rotary process,' which has been adopted in some American plants, the gypsum is not pulverized until after calcining. The crushed rock gypsum is fed directly into the calciner and the product after cooling is conveyed to the grinding mills. For wall plaster hair or other fibre is added in the proportion of 1½ to 3 lbs. per ton of plaster.

Cement plasters are made in the same manner as plaster-of-paris, except that an impure gypsum is used or foreign materials are added to retard the setting process; the temperature for calcining is higher than for plaster-of-paris (396° F.). A pure plaster-of-paris will set in from five to fifteen minutes after having been mixed with water. By the use of retarders the setting can be delayed so as to require one to two hours—an important requirement for structural work. Among retarders in common use are glue, sawdust, blood, and packing-house tankage.

Flooring and hard-finish plasters set more slowly than plaster-of-paris and cement plasters, becoming very hard. Flooring plaster is made by burning pure gypsum at a temperature of about 500° F. It is entirely free from water. Hard-finish cements are prepared similarly, but are chemically treated during the manufacturing process. One of the best known is Keene's cement, for which the burned gypsum is immersed in a bath of alum solution, dried, and again burned at a high temperature.

Stucco is a fine gypsum plaster, though the term is used loosely of any plaster or cement for the external coating of buildings. See STUCCO.

Bituminous Cements, which are prepared chiefly from the natural asphalt, were used in the earliest times for compacting sun-dried bricks, and in place of other mortars in laying up brick and stone masonry. To-day, their chief uses are to form pavements, to cement together the elements of brick and stone pavements, to serve as roofing materials, to use in calking ships, and for waterproofing courses in foundations and along walls. They are employed also in numerous minor applications as true cements (for joining separate parts), besides serving as bases for paints. Coal and wood tars and natural asphalt are the raw materials. They are usually fluxed to suitable consistency with lighter mineral oils, and set mainly by the evaporation of the oil. Pure asphalt ranks highest, retaining its elasticity, while pitch or tar products become brittle by slow chemical changes; asphalt is also highest in cost.

Bituminous macadam or concrete is a modern paving material which makes use of the cementing properties of bitumens. The softened bitumen is mixed with broken stone and deposited and rolled in a layer 4 to 6 inches thick, forming a strong, elastic, and durable pavement. The widely used asphalt pavement, made of what amounts to an asphalt-and-sand mortar, also utilizes the cementing powers of asphalt.

Adhesives and Lutes.—These useful materials are so diverse that for details reference must be made to special works. They include such simple materials as fire-clay, used in cementing up the bricks of furnace linings; glazier's putty, which is whiting mixed with linseed oil; white lead and red lead in linseed oil, and the 'rust joint,' consisting of iron filings wet with sal-ammoniac solution. They also include many more complex substances. Rubber cement is made by dissolving rubber in carbon disulphide, with or without addition of boiled linseed oil; leather cement is made of equal parts of hide glue and American isinglass, softened in water and boiled with pure tannin. Glue, or animal gelatine, is a widely used cement. Glue with half its quantity of glycerine and several volumes of water makes a compound that stiffens rapidly on cooling. Clay with linseed oil, sulphur, and asbestos; litharge and glycerine; and various other mixtures are useful as acid-proof cements. Most of these compounds may be classified under resinous cements, or those which soften by heat and harden when cold—*e.g.*, sealing-wax, marine glue, shellac solutions; those in which adhesion results from the evaporation of the solvent employed—such cements being solutions of combinations in alcohol, benzine, chloroform, carbon bisulphide, or other hydrocarbon fluid; oleaginous cements, or compounds in which oil is the solvent principle; this, by absorbing oxygen, causes the cementing compound to exhibit adhesive properties. Compounds of red or white lead in linseed oil are typical of this class. Still another class of cements includes those of a gummy or gelatinous nature, there being two kinds—those which soften in water but not by heat (*e.g.* gum-arabic, dextrin, and gelatin glues) and those which are either gelatinized or dissolved in water or in aqueous solution, and harden through the absorption of the water by the materials cemented. Casein, albumen, and collodion also have cementing uses. Vegetable gums and oils are the cementing ingredients forming the base of nearly all paints, linseed oil being of chief importance because of its strong power of hardening by absorbing oxygen.

Bibliography.—Consult Redgrave's *Calcareous Cements, their Nature and Uses;* Butler's *Portland Cement;* Dibdin's *Lime, Mortar, and Cement;* Standage's *Cements, Pastes, Glues, and Gums;* Cummings' *American Cements;* Blount's *Cement* (1920); Eckels' *Cements, Limes, and Plasters* (2d ed. 1922).

Cementa'tion, a process of converting (pure) wrought iron into steel by raising it to a white heat in contact with carbon. See STEEL.

Cement Rock, WATER LIME, or HYDRAULIC LIMESTONE, a variety of limestone containing siliceous clay as an impurity, making a mixture suitable for cement manufacture. The rock is quarried in small blocks, burned in kilns by charging from above with coal, withdrawn at the bottom as clinker, and ground to a fine flour-like product that has the property of setting or hardening when mixed with water. This is the natural rock-cement as distinguished from Portland cement, which is made by mixing clay and lime artificially and then burning (see Cement). The output of natural rock-cement in the United States in 1923 was 1,271,674 barrels, valued at $1,947,352. Minnesota is the leading producer.

Cement Stones, a group of rocks belonging to the lowest Carboniferous of Scotland. They pass down into the Upper Old Red Sandstone by means of the Ballagan Beds, while above them lie the Burdiehouse limestone and the oil shales group of the Calciferous Sandstone. They were partly deposited in lagoons and estuaries, and are a transition between the fresh-water deposits of the Old Red and the truly marine Carboniferous limestone. The town of Edinburgh is built on rocks which belong mostly to this group, and Arthur's seat is an ancient volcano of this epoch.

Cem'etery, a portion of land set apart for the burial of the dead, the word being first applied to such places by the early Christians. In early times burial was usually made in tombs; later, prominent ecclesiastics were buried in or beneath the churches; then, as space in the churches was limited, came the custom of burying the dead in the surrounding yards. As population increased, the necessity arose of establishing cemeteries away from the centres of activity, and by 1860, in the United States, the practice of churchyard burial had been practically discontinued except in the smallest communities. In America, the greater number of cemeteries are owned and managed by the smaller cities, but the largest and best managed are usually controlled by private corporations.

Probably the most famous of modern cemeteries are the *Campo santo* in Pisa, Italy, and *Père Lachaise*, in Paris, France. The American cemeteries of Mount Auburn, near Boston, and Greenwood, New York City, are conspicuous for their beauty of plan and careful maintenance. In the United States, there are more than eighty national cemeteries, containing the graves of more than 360,000 American sailors and soldiers. The best known of these is that in Arlington, Va. See Burial; Burial Customs.

Cenci, chen'chē, Beatrice (1577–99,) a Roman lady of patrician birth. According to a story long accepted as true, her father, an old man, after conceiving an incestuous passion for his daughter, was put to death by an assassin employed by his wife, his son Giacomo, and Beatrice. The conspirators were subsequently executed by order of Pope Clement viii., who at the same time confiscated the property of the Cenci. This legend is the subject of a powerful tragedy by Shelley. Researches by Bertolotti, in the nineteenth century, cast serious doubts on the authenticity of the incidents related above. Consult that author's *Francesco Cenci e la sua famiglia* (1879).

Ceneda, Italy. See Vittorio.

Cenis, Mont, môṅ se-nē', a peak of the Alps (6,831 ft.), close to the Franco-Italian frontier. One of the great historic Alpine passes, it has been known since the fourth century. Until the nineteenth century it was crossed only by mule or sledge; in 1803–13 a carriage road over the pass was constructed by Napoleon, and in 1868–71 the Fell Railway, an experimental cogwheel railway, was built. On the completion of the Mont Cenis Tunnel (8 miles long) in 1871, a gigantic undertaking costing more than $14,000,000, the Fell Railway was destroyed. Near the summit of the peak is a hospice founded in the ninth century and rebuilt by Napoleon, now occupied as barracks.

Cenobites. See Cœnobites.

Cenomanni, sen-ō-man'ī *or* sen-ō-mä'nē, or Cenomani, a Celtic people of the Aulerci nation of Gaul, who inhabited what is now the department of Sarthe. Their capital was Vindinum or Suindinum (Le Mans). A branch of the Cenomanni invaded Italy in the sixth century b.c., and occupied the left bank of the Po, between the Adda and the Adige, with Verona as their capital.

Cenotaph, sen'ō-táf, usually the tomb or monument of one deceased but not interred there, originally employed in cases where the bodies of persons could not be recovered, such as death in foreign wars or by drowning.

Cenozoic. See Tertiary.

Cen'ser, a metal vessel used in the Eastern, the Roman Catholic, and, occasionally, the Anglican church for burning incense during divine service. It is usually of brass or copper, bowl-shaped, and suspended on three chains, on which the cover can slide up and down. The vessel itself holds the charcoal and the incense; and the cover is perforated to allow the smoke to escape.

Cen'sor, the title of the two magistrates in ancient Rome who were highest in dignity, if not in power, whose duty it was primarily to take the census of the people, a part of the solemn ceremony of purification performed every five years. This duty originally devolved upon the king, and then upon the consuls; but when, in 444 b.c., the military tribunate, open to plebeians, replaced the consulship, the senate instituted the censorship for the next year, confining it to patricians. The first plebeian elected to the office was C. Martius Rutilus, in 351 b.c.; in 339 b.c. the Publilian laws provided that at least one censor should be a plebeian, and in 131 b.c., for the first time, both were plebeians.

The power of the censors depended upon the fact that with them lay absolutely the classification of the citizens in their centuries and tribes, so that the enfranchisement both of individuals and of classes rested with them, as did the making up of the roll of senators and knights (they could degrade from or promote to these orders at their choice, until the legislation of Sulla in 81 b.c.), the general supervision of morals, and the administration of the state finances. In connection with their supervision of morals, they had the right of affixing a stigma (*nota censoria*) to the name of any man enrolled in their lists—a much-dreaded disgrace. They also endeavored to regulate the expenses and luxury of private life by many sumptuary laws. Their financial powers depended primarily on their making a census of property; they supervised, too, the administration of other branches of revenue, though they did not collect or expend the state income. A law enacted in 265 b.c. provided that no one should be elected censor a second time. The office disappeared with the republic.

Cen'sorate, Military, a government department organized in time of war for the purpose of insuring secrecy and protection. It is usually headed by a chief censor, assisted by a supervisor and several subordinates. The duty of the censorate is to see that no information which might be of any assistance to the enemy is transmitted by means of letters, telegrams, or press articles. Modern newspaper methods have necessitated a more rigid and careful surveillance than was exercised in earlier times, and during the progress of armed conflicts the censorate is increasingly important.

Cen'sorship of the Drama. Before the Reformation in England ecclesiastical ordinances regulated the stage, but in the reign of Elizabeth the state assumed control, and several acts were passed to prohibit plays objectionable to the government. In 1545 the duties of dramatic censor were allotted to the master of the revels, with whom others were sometimes associated, and the duties afterward devolved (about 1624) on the Lord Chamberlain. All political allusions were forbidden, but in other directions the greatest license was allowed. The gathering forces of Puritanism consequently regarded the stage as an unclean thing, and when the English civil wars began (1624) the theatres were immediately closed. With the Restoration came the inevitable reaction. Fielding's plays, *Pasquin* (1736) and the *Historical Register* (1737), in which he freely travestied the political transactions of the day, and a scurrilous piece called *The Golden Rump*, attacking the ruling powers, led to an act (1737) which gave legal sanction to the customary censorship by the Lord Chamberlain. In 1843 a new Theatres Act was passed which repealed previous statutes, substituting new provisions but leaving the question of licensing plays in the hands of the Lord Chamberlain as theretofore.

In 1866 a select committee of the House of Commons reported that the discretion reposed in the Lord Chamberlain had been, on the whole, wisely exercised, stated that the censorship of plays had worked satisfactorily, and recommended its extension as far as possible to music hall performances. In 1892 another select committee of the House of Commons repeated and endorsed the opinions of their predecessors.

In 1909 an investigating committee, appointed in response to a petition from forty authors for the abolition of the censorship, reported a compromise. The censorship was retained in the hands of the Lord Chamberlain; but it was made optional to submit a play for license, and legal to perform an unlicensed play, whether it had been submitted or not, under the condition that it is subject to prosecution by the public prosecutor for any breach of morals or decorum. This clause gives practical independence of the censor, where that is desired, under conditions of production similar to those in the United States.

In *France* the state censorship of plays ceased in 1906. The only restraint upon a theatrical performance at present is exercised by the police authorities, who may, if they think a play dangerous to public morals, prosecute the manager of the theatre. In *Denmark* there is a censor of plays appointed by the Ministry of Justice, and in *Holland* the control of theatrical performances is vested in the burgomaster of each town. In *Italy* the permission of the prefect of the province in which it is to be performed must be obtained for the production of any opera or stage play.

In the *United States* the supervision of dramatic productions falls to the local police or the mayor or other officials issuing the licenses for theatres and dramatic productions. There has been much discussion on the subject, and various attempts have been made to establish a legal censorship of the drama, but without success. A law which permits public immorality to be suppressed if shown by any overt act seems to cover the ground to general satisfaction. The creation of the office of censor, therefore, seems unlikely, as long as the censorial powers now vested in public opinion continue to be exercised with a fair balance of good judgment.

Censorship of the Press, the official supervision of the publication of books, pamphlets, newspapers, and periodicals, with a view to preventing the printing and circulation of matter subversive of law or morals. Early in the sixteenth century Pope Alexander VI. issued a bull against unlicensed printing, probably the first example of the principle of censorship. All countries under the jurisdiction of the Roman Catholic Church accepted this injunction and to this day all books published within the Church's control are subjected to strict examination, being expurgated or suppressed if it is deemed necessary (see INDEX LIBRORUM PROHIBITORUM.). In England the censorship of the press passed from the Church to the Crown and later to Parliament and was used to prevent the circulation of news thought dangerous to the body politic. Laws providing for licensing and censorship persisted and were enforced until 1693, when the last censorship act was abolished by legislative enactment. In France a strict censorship of the press was in force under the monarchy. It was abolished at the Revolution but revived during the Napoleonic period, when it reached extreme limits. In 1881 all restrictions on the French press, were virtually removed. In Germany the Resolutions of Carlsbad in 1819 provided for a rigid censorship of the press, but in 1850 the constitution of Prussia forbade such censorship and legislation in regard to the press was later vested in the Imperial Government. In the United States there has never been a true censorship of the press, although there are laws against libel and the publication of scandalous matter.

In its origin the theory of censorship of the press is that of protection of the weak against pernicious or dangerous thought. In normal times this theory, while not abandoned, is usually held in abeyance but in times of revolution, warfare, or other disturbances, it comes to the front and is vigorously enforced. During the Great War a strict censorship was exercised in all countries, giving rise, as is inevitably the case, to a vast amount of criticism. The press practically everywhere acquiesced in the censorship although not in all cases approving it. See also FREEDOM OF THE PRESS.

Census, an enumeration of the people in a country or district. The word is a Latin one, originally applied to the functions which the Roman censors performed, of periodically enumerating the people. Only a few scattered notices of these enumerations remain. In Greece a census was established by Solon at Athens for the double purpose of facilitating taxation and classifying the citizens, and other ancient countries seem to have made similar enumerations for various purposes—military, financial, etc.

To Sweden is generally awarded the honor of the first modern census on something like a scientific basis, in 1749; but in the French colony of Canada, periodical enumerations of the people had been made during a century previous, and these were continued after Canada passed into British hands.

The first country of large area to provide for a periodical enumeration of its population was the United States, where the first census was taken in 1790. In 1753, a proposal to establish a census in England was rejected, but in 1801, and regularly since that date, a decennial census has been taken in that country. Denmark, Norway, and France also took their first censuses in 1801, but in France it was not until 1831 that any provision was made for its periodical recurrence. French and German censuses are now taken at five-year periods; while the United States, Canada, Great Britain and her colonies, Italy, Russia, Austria, Belgium, Norway, and India have a decennial census.

When census taking first became a governmental function, it was hardly more than an enumeration of population. Even at the present time, popular interest is confined largely to a consideration of the growth and distribution of population and to the sociological significance of these returns; while the results of inquiries of more recent addition, such as those relating to manufacturing, agriculture, mining, etc., are of less general interest, appealing rather to special groups of the population.

Population of the World.—It has been estimated by S. N. D. North, former Director of the U. S. Census, that at least 700 millions of people are periodically enumerated, that 300 millions have been enumerated once or twice at irregular periods, and that the remaining 700 millions of the population of the globe have never been counted.

The population of the world, based on latest estimates for the various countries, and, where no estimates were available, on the latest census returns, was in 1920 1,748,000,000, distributed as follows:

North America	136,000,000
South America	64,000,000
Europe	476,000,000
Asia	921,000,000
Africa	142,000,000
Australia and Oceania	9,000,000
Total	1,748,000,000

Census of the United States.—In the United States provision was made for the first census and a decennial census thereafter in the Constitution, Article I, Section 2, which reads: 'Representatives and direct taxes shall be apportioned among the several States which may be included within this Union according to their respective numbers. . . . The actual enumeration shall be made within three years after the first meeting of the Congress of the United States and within every subsequent term of ten years, in such manner as they shall by law direct.' From being merely a basis for Congressional apportionment, however, the census has come in succeeding years to be a valuable inventory of national development and resources. In 1790 a single schedule, containing two or three inquiries with reference to color, sex, and age of each person enumerated, was used. The number and extent of the inquiries were steadily increased—particularly after 1850—until the censuses of 1880 and 1890, when the schedules used, particularly those relating to manufactures, became so complicated and so overloaded with inquiries that it was found advisable in subsequent censuses to narrow somewhat the scope of inquiries and simplify the schedules to a considerable extent.

In 1902 a permanent Census Bureau (see CENSUS, U. S. BUREAU OF) under the Department of the Interior was organized, to which bureau, during the intercensal period, have been assigned various lines of investigation formerly included within the scope of the decennial census. It is now possible, owing to the organization of the permanent bureau, to confine the regular decennial census to a more limited field of investigation, making possible greater accuracy of enumeration than heretofore. Within the period of the census taking the personnel of the Census Bureau is enormously increased and the whole department operates on a different basis than during the intercensal period.

The census comprises four principal groups of subjects: population; agriculture, including irrigation and drainage; manufactures; and mines and quarries. The territory covered includes each State of the United States, the District of Columbia, Alaska, Hawaii, Porto Rico, Guam, Samoa and the Panama Canal Zone.

The information with reference to population and agriculture is secured by enumerators specially appointed for this task; while the information relative to manufactures, and mines and quarries, is, for the most part, collected by special agents appointed by the Director of the Census, or by employees of the permanent bureau especially detailed for that purpose. The enumeration of the population is taken as of January 1. It is usually provided that the decennial census period shall occupy three years, and that the reports shall be completed and published within that period.

The enormous task of counting a population of nearly 118,000,000 included within the United States and its dependencies demands a high degree of organization. The law provides for the appointment of an adequate number, usually between 300 and 400, of supervisors who have immediate charge of the enumerators in the several fields assigned to them, the supervisors being in turn directly responsible to the Director of the Census. The total number of enumerators required to take the census of 1920 was about 87,000.

Schedules for use in securing the desired information are prepared under the supervision of the Director of the Census and issued to the various enumerators. They comprise in general the following information:

Population.—Name; place of abode; relationship to head of family; color; sex; age; conjugal condition; place of birth; nationality or mother tongue, if of foreign birth; place of birth of parents; nationality or mother tongue of parents, if of foreign birth; number of years in the United States; citizenship; occupation; employer or employee; school attendance; literacy; tenure of home· deaf and dumb; statistics of inmates of institutions, as paupers, prisoners, the insane, and the blind.

Agriculture.—Name, color, and country of birth of each farm occupant; tenure and acreage of farm; acreage in woodland and character of timber; value of farm and improvements, and of farm implements; number and value of live-stock, and of domestic animals; acreage of crops for the current year; acreage and value of crops for the preceding year.

Manufactures, and Mines and Quarries.—Name and location of each establishment; character of organization (individual, co-operative, etc.); character of business, or kind of goods manufactured; amount of capital actually invested; number of proprietors, firm members, co-partners, stockholders and officers, with the amount of their salaries; number of employees, and amount of their wages; quantity and cost of material; amount of miscellaneous expenses; quality and value of products; time in operation during the current year; character and quantity of power used; character and number of mechanics employed.

The returns, before being tabulated, are carefully inspected for omissions, errors, and inconsistencies. The tabulation is then done by the use of punch cards, the facts ascertained regarding each person, farm, or establishment being recorded by punching holes in these cards. Card punching machines are used for this work. The cards for each locality are counted by means of machinery so devised as to register electrical contacts made through the punched holes, and the tabulated facts for each unit area are automatically recorded, thus avoiding errors which might result from recording the results by hand, and also expediting the work of tabulation.

The returns thus tabulated are analysed, and the reports embodying them prepared by qualified statisticians and economists. The results of the census are published from time to time in the shape of bulletins, and subsequently appear in permanent form in large quarto volumes.

The returns from the 1920 census show a population in Continental United States of 105,710,620, as compared with 91,972,266 in 1910, an increase of 14.9 per cent. Of this population 94,820,915, or 89.7 per cent., is white; 10,463,131, or 9.9 per cent., is Negro; 244,437, or .2 per cent., is Indian; 61,639, 0.05 per cent., is Chinese; 111,010 or 0.1 per cent., is Japanese, and the rest is scattering. In the last decade the white population has increased 16 per cent. and the negro 6.5 per cent. As compared

TEMPORARY PAGES FOR NELSON'S L. L. ENCYCLOPÆDIA

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U.S. Census Reports for Population of Cities over 3,500
Received up to July 1 , 1930

	1920	1930
Abbeville, Ky.	3,461	4,356
Aberdeen, Miss.	4,071	3,922
Aberdeen, Wash.	15,337	21,718
Abilene, Texas	10,274	23,129
Abington, Mass	5,787	5,871
Acushnet, Mass	3,075	4,092
Adams, Mass	12,967	12,601
Adrian, Mich.	11,878	12,891
Aiken, S. C.	4,103	6,033
Akron, Ohio	208,435	253,653
Alabama City, Ala.	5,432	8,544
Alameda, Calif.	28,806	34,367
Alamo Heights, Texas	.....	3,853
Albany, Calif.	2,462	8,593
Albany, Ga.	11,555	14,489
Albert Lea, Minn.	8,056	10,024
Albia, Iowa	5,067	4,621
Albuquerque, N.M.	15,157	26,526
Alcoa, Tenn.	3,358	5,263
Alexander City, Ala.	2,293	4,518
Alexandria, Ky.	17,510	23,010
Alexandria, Va.	18,060	24,185
Algona, Iowa	3,724	3,840
Alhambra, Calif.	9,096	29,450
Alice, Texas	1,880	4,182
Allentown, Pa.	73,502	92,052
Alliance, Nebr.	4,591	6,669
Alpona, Mich.	11,101	12,122
Altoona, Pa.	60,331	81,503
Altus, Okla.	4,522	8,473
Amesbury, Mass.	10,036	11,887
Amherst, Mass.	5,550	5,886
Amityville, N. Y.	3,265	4,431
Amsterdam, N. Y.	33,524	34,683
Anaconda, Mont.	11,668	12,529
Anacortes, Wash.	5,284	6,397
Anadarko, Okla.	3,116	5,041
Anaheim, Calif.	5,526	10,817
Anamosa, Iowa	2,218	3,556
Andover, Mass.	8,268	9,965
Ann Arbor, Mich.	19,516	26,872
Anniston, Ala.	17,734	22,333
Anoka, Minn.	4,287	4,820
Ansonia, Conn.	17,643	19,860
Antigo, Wisc.	8,451	8,599
Antioch, Calif.	1,936	3,539
Appalachia, Va.	2,036	3,595
Arcadia, Calif.	2,239	5,201
Arkansas City, Kan.	11,253	13,914
Arlington, Mass.	18,665	36,089
Arlington, Texas	2,031	3,638
Arlington Hghts., Ill.	2,250	4,986
Arnold, Pa.	6,120	10,473
Ashland, Ohio	9,249	11,036
Ashland, Pa.	6,666	7,164
Ashland, Wisc.	11,334	10,623
Ashley, Pa.	7,520	7,094
Athens, Pa.	4,384	4,370
Athens, Texas	3,176	4,245
Atlantic City, N. J.	50,707	65,748
Attalla, Ala.	3,462	4,585
Attica, Ind.	3,392	3,687
Attleboro, Mass.	19,731	21,776
Auburn, Ind.	4,650	5,084
Auburn, Me.	16,985	18,567
Auburn, Mass.	3,891	6,147
Audubon, N. J.	4,740	8,899
Augusta, Ga.	52,548	59,659
Augusta, Kan.	4,219	4,033
Augusta, Me.	14,114	17,189
Aurora, Ind.	4,369	4,299
Austin, Minn.	10,118	12,261
Avalon, Pa.	5,277	5,932
Azusa, Calif.	2,460	4,803

	1920	1910
Babylon, N. Y.	2,523	4,332
Bainbridge, Ga.	4,792	6,138
Bakersfield, Calif.	18,638	26,179
Ballston Spa, N. Y.	4,103	4,576
Baltimore, Md.	733,826	789,921
Bangor, Me.	28,701	25,978
Baraboo, Wisc.	5,538	5,537
Barberton, Ohio	18,811	23,932
Bar Harbor, Me.	3,622	4,476
Barnesboro, Pa.	4,183	3,506
Barnstable, Mass.	4,836	7,305
Barre, Mass.	3,357	3,511
Barre, Vt.	3,862	4,259
Barrington, R. I.	3,897	5,143
Bath, Me.	14,731	9,093
Bath, N. Y.	4,795	4,002
Bayfield, Wisc.	21,284	23,609
Bayonne, N. J.	76,754	85,796
Bay St. Louis, Miss.	3,033	3,725
Beacon, N. Y.	10,996	11,921
Beardstown, Ill.	7,111	6,353
Beatrice, Nebr.	9,664	10,274
Beaver Dam, Wisc.	7,992	9,856
Beckley, W. Va.	4,149	9,350
Bedford, Ind.	9,076	13,140
Belfast, Me.	5,083	4,983
Bell, Calif.	.....	7,884
Bellaire, Ohio	15,061	13,327
Bellefontaine, Ohio	9,336	9,535
Bellevue, Pa.	8,198	10,250
Bellwood, Ill.	1,881	4,985
Belmont, Mass.	10,749	21,707
Belton, Texas	5,098	3,779
Belvidere, Ill.	7,114	8,114
Bemidji, Minn.	7,086	7,172
Bend, Ore.	5,415	8,821
Benton Har., Mich.	12,233	15,416
Berea, Ohio	2,959	5,831
Berkeley, Calif.	28,806	34,367
Berkley, Mich.	.....	5,558
Berlin, Conn.	4,298	4,869
Berlin, Wisc.	4,400	3,940
Berwick, Pa.	12,181	12,674
Bessemer, Mich.	5,482	4,019
Bethel, Conn.	2,201	3,871
Beverley, Mass.	22,561	24,985
Beverly Hills, Calif.	56,036	81,543
Biddeford, Me.	18,008	17,618
Big Rapids, Mich.	4,558	4,670
Big Spring, Texas	4,273	13,731
Billerica, Mass.	3,646	5,867
Billings, Mont.	15,100	16,332
Biloxi, Miss.	10,937	14,668
Binghamton, N. Y.	66,800	76,601
Birmingham, Ala.	178,806	257,657
Bismarck, N. D.	7,122	11,081
Blackstone, Mass.	4,299	4,672
Blackwell, Okla.	7,174	9,365
Blairsville, Pa.	4,391	5,296
Bloomfield, N. J.	22,019	37,245
Bloomsburg, Pa.	7,819	9,093
Blue Island, Ill.	11,424	16,509
Bluffton, Ind.	5,391	4,969
Blytheville, Ark.	6,447	10,095
Boise, Idaho	21,393	20,460
Boone, Iowa	12,451	11,874
Boonton, N. J.	5,372	6,766
Bordentown, N. J.	4,371	4,399
Boston, Mass.	748,060	775,729
Bowling Green, Ky.	9,638	12,340
Bowling Green, Ohio.	5,788	6,664
Bozeman, Mont.	6,183	6,818
Brackenridge, Pa.	4,987	6,251
Braddock, Pa.	19,301	20,879
Bradentown, Fla.	3,868	5,976

	1920	1930
Brainerd, Minn.	9,591	10,186
Braintree, Mass.	10,580	15,673
Brandford, Conn.	6,627	7,080
Brattleboro, Vt.	8,332	9,745
Brawley, Calif.	5,389	10,437
Brazil, Ind.	9,293	8,801
Bremerton, Wash.	8,918	10,124
Brenham, Texas	5,066	5,860
Brentwood, Pa.	1,695	5,381
Brewer, Me.	6,328	6,064
Bridgeport, Conn.	143,555	147,206
Bridegport, Ohio	3,977	4,656
Bridgeton, N. J.	14,323	15,710
Bridgeville, Pa.	3,092	4,394
Bridgewater, Mass.	8,438	9,052
Brigham, Utah	5,282	5,092
Bristol, Conn.	20,620	28,402
Bristol, Pa.	10,273	11,800
Bristol, R. I.	11,375	12,117
Brockton, Mass.	66,254	63,695
Bronxville, N. Y.	2,055	6,256
Brookfield, Ill.	3,589	10,015
Brookhaven, Miss.	4,706	5,283
Brookings, S. D.	3,924	4,367
Brookline, Mass.	37,748	47,437
Brownwood, Texas	8,223	12,781
Brunswick, Me.	7,261	7,592
Brunswick, Md	3,905	3,671
Bryan, Ohio	4,252	4,670
Bryan, Texas	6,307	7,814
Buchanan, Mich.	3,187	3,916
Buckhannon, W. Va.	3,785	4,369
Bucyrus, Ohio	10,425	9,942
Buffalo, N. Y.	506,775	572,913
Burbank, Calif.	2,913	16,429
Burlingame, Calif.	4,107	13,055
Burlington, Iowa	24,057	26,719
Burlington, N. C.	5,952	9,732
Burlington, Wisc.	3,626	4,119
Butte, Mont.	41,611	39,540
Cadillac, Mich.	9,750	9,571
Cadiz, Ohio	15,061	13,327
Cairo, Ill.	15,203	13,525
Calais, Me.	6,084	5,457
Caldwell, N. H.	3,993	5,088
Calexico, Calif.	6,223	6,297
Calumet City, Ill.	.....	12,276
Camden, Me.	3,403	3,587
Camden, N. J.	116,309	117,172
Cameron, Mo.	3,248	3,503
Canastota, N. Y.	3,995	4,235
Canon City, Colo.	4,551	5,918
Canton, Ill.	10,928	11,751
Canton, Mass.	5,945	5,806
Caribou, Me.	6,018	7,208
Carlsbad, N. M.	2,205	3,689
Carnegie, Pa.	11,516	12,548
Carroll, Iowa,	21,549	23,318
Carrollton, Mo.	3,218	4,054
Carteret, N. J.	11,047	12,634
Cartersville, Ga.	4,350	5,255
Carthage, N. Y.	4,320	4,461
Caruthersville, Mo.	4,750	4,737
Cape Girardeau, Mo.	10,252	16,148
Castle Shannon, Pa.	2,353	3,808
Cedar, Utah	2,462	3,618
Cedar Falls, Iowa	6,316	7,271
Cedarhurst, N. Y.	2,838	5,067
Cedar Rapids, Iowa	45,566	55,939
Centerville, Iowa	8,486	8,128
Chadron, Nebr.	4,412	4,608
Champaign, Ill.	15,873	20,332
Chariton, Iowa	5,175	5,353
Charleston, Ill.	6,615	8,004

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	1920	1930
Charleston, S. C.	67,957	62,123
Charleston, W. Va.	39,608	60,411
Charlotte, Mich.	5,126	5,307
Charlotte, N. C.	46,338	82,645
Chatham, N. J.	2,421	3,959
Chattanooga, Tenn.	57,895	119,539
Chelmsford, Mass.	5,682	7,045
Chelsea, Mass.	43,184	44,827
Cherokee, Iowa	5,824	6,406
Cherryvale, Kan.	4,698	4,242
Chester, Pa.	58,030	58,350
Cheviot, Ohio	4,108	8,008
Chicago, Ill.	2,701,705	3,373,753
Chicago Hghts., Ill.	10,653	22,311
Chickasha, Okla.	10,179	14,019
Chico, Calif.	9,339	7,893
Chicopee, Mass.	36,214	43,981
Childress, Texas	5,003	7,163
Chula Vista, Calif.	1,718	3,862
Cincinnati, Ohio	401,247	449,331
Claremont, N. H.	9,524	12,343
Claremore, Okla.	3,435	3,713
Clarinda, Iowa	4,511	4,960
Clairton, Pa.	6,264	15,284
Clarksburg, W. Va.	27,869	28,831
Clay Center, Kan.	3,715	4,401
Clayton, Mo.	3,028	9,592
Clearwater, Fla.	2,427	7,532
Cleburne, Texas	12,820	11,466
Cleveland, Ohio	796,841	901.482
Cleveland Hghts., O.	15,236	50,123
Clifton, N. J.	26,470	45,673
Clinton, Ind.	10,962	7,925
Clinton, Iowa	24,151	25,740
Clinton, Mo.	5,098	5,745
Cloquet, Minn.	5,127	6,770
Coaldale, Pa.	6,336	6,921
Coatesville, Pa.	14,515	14,525
Cohoes, N. Y.	22,987	23,201
Compton, Calif.	1,478	12,291
Concord, Mass.	6,461	7,491
Concord, N. H.	22,167	25,162
Concord, N. C.	9,903	11,821
Conneaut, Ohio	9,343	9,683
Conshohocken, Pa.	8,481	10,838
Corbin, Ky.	3,406	8,029
Corinth, Miss.	5,498	6,168
Corning, N. Y.	15,820	15,648
Corona, Calif.	4,129	7,019
Coronado, Calif.	3,289	5,424
Corry, Pa.	7,228	7,129
Corvallis, Ore.	5,752	7,581
Coshocton, Ohio	10,847	10,885
Council Bluffs, Iowa	36,162	42,023
Coventry, R. I.	5,670	6,420
Covington, Ky.	57,121	65,247
Colton, Calif.	4,282	8,013
Columbia, S. C.	37,524	50,195
Columbia City, Ind.	3,499	3,791
Columbia Hts., Minn.	2,968	5,567
Columbus, Ind.	8,990	9,832
Columbus, Nebr.	5,410	6,896
Crafton, Pa.	5,964	6,961
Creston, Iowa	8,034	8,591
Cross Creek, N. C.	10,875	14,133
Crowley, La.	6,108	7,656
Crown Point, Ind.	3,232	4,044
Crystal City, Texas	.....	6,610
Cuero, Texas	3,671	4,727
Cumberland, Md.	29,837	37,713
Cumberland, R. I.	10,077	10.299
Culver, Calif.	503	5,591
Cuyahoga Falls, O.	10,200	19,522
Cynthiana, Ky.	4,385	3,857
Dalhart, Texas	2,676	4,430
Dallas, Iowa	25,120	25,553
Dallas, Texas	158,976	260,397
Dalton Ga.	5,222	8,143
Daly City, Calif.	3,779	7,833
Danbury, Conn.	18,943	21,615
Dansville, N. Y.	4,631	4,925
Danvers, Mass.	11,108	12,952
Danville, Ill.	33,776	36,646
Danville, Pa.	6,952	7,189
Darien, Conn.	4,184	6,926
Dartmouth, Mass.	6,493	8,766
Davenport, Iowa	56,727	60,782
Dawson, Ga.	3,504	3,827
Dayton, Ohio	152,559	200.225
Decatur, Ala.	4,467	15,447
Decatur, Ind.	4,762	5,155
Dedham, Mass.	10,792	15,650
Deer Lodge, Mont.	3,780	3,503
Delaware, Ohio	8,756	8,663
Delphes, Ohio	5,745	5,670
Denison, Iowa	3,581	3,905
Denison, Texas	17,065	13,851
Denton, Texas	7,626	9,548
Depew, N. Y.	5,850	6,536
Derby, Conn.	11,238	10,790
Derry, N. H.	5,382	5,120
Des Moines, Iowa	126,468	142,469
Des Plaines, Ill.	3,451	8,969
Detroit, Mich.	993,678	1,564.397
Detroit Lakes, Minn.	3,416	3,649
Devils Lake, N. D.	5,140	5,705
Dexter, Me.	4,113	4,063
Dickinson, N. D.	4,122	4,874
Dixon, Ill.	8,191	9,897
Dobbs Ferry, N. Y.	4,401	5,691
Dodge City, Kan.	5,061	10,060
Dormont, Pa.	6,455	13,137
Dothan, Ala.	10,034	15,471
Dover, Del.	4,042	4,771
Dover, N. H.	13,029	13,576
Dover-Foxcroft, Me.	4,050	3,742
Dowagiac, Mich.	5,440	5,540
Downers Grove, Ill.	3,543	8,971
Dracut, Mass.	5,280	6,899
Dresden, Ohio	1,434	4,362
Dubuque, Iowa	39,141	41,678
Dudley, Mass.	3,701	4,267
Duncan, Okla.	3,463	8,316
Dunellen, N. J.	3,394	5,150
Dunn, N. C.	2,805	4,557
Duquesne, Pa.	19,011	21,446
Durham, N. C	21,719	52,026
Eagle Grove, Iowa	4,433	4,062
Eagle Pass, Texas	5,765	5,056
Easley, S. C.	3,568	5,023
East Alton, Ill.	1,669	4,494
East Aurora, N. Y.	3,703	4,809
East Cleveland, O.	27,292	40,279
East Conemaugh, Pa.	5,256	4,845
East Detroit, Mich.	.....	5,933
East Hartford, Conn.	11,648	16,415
East Haven, Conn.	3,520	7,858
East Lansing, Mich.	1,889	4,372
East Mauch Chunk, Pa.	3,868	3,739
East Moline, Ill.	8,675	10,095
Easton, Mass.	5,041	5,298
East Orange, N. J.	50,710	67,344
East Pittsburgh, Pa.	6,527	6,216
East Providence, R.I.	21,793	30,252
East Rockaway, N.Y	2,005	4,338
East St. Louis, Ill.	66,767	74,024
East Syracuse, N.Y.	4,106	4,643
East Windsor, Conn.	3,741	3,597
Ecorse, Mich.	4,394	12,716
Edenton, N. C.	2,777	3,562
Edgewood, Pa.	3,181	5,114
Edmond, Okla.	2,452	3,539
Edwardsville, Ill.	5,336	6,211
Effingham, Ill.	4,924	4,961
Elberton. Ga.	6,475	4,649
El Centro, Calif.	5,464	8,427
El Cerrito, Calif.	1,505	3,848
Electra, Texas	4,744	6,703
Elgin, Ill.	27,454	35,806
Elizabeth, N. J.	95,783	114,551
Elizabeth City, N. C.	8,925	10,030
Ellsworth, Me.	3,058	3,547
Elmhurst, Ill.	4,594	13,579
Elmira Hghts., N. Y.	4,188	5,059
Elmsford, N. Y.	1,535	3,963
Elmwood Park, Ill.	1,380	11,149
Elmwood Place, Ohio.	3,991	4,562
El Reno, Okla.	7,737	9,379
Elwood, Ind.	10,790	10,676
Elyria, Ohio	20,474	25,606
Endicott, N. Y.	12,803	16,226
Enfield, Conn.	11,719	13,403
Englewood, Colo.	4,356	7,954
Englewood, N. J.	11,627	17,819
Eric, Pa.	93,372	115,875
Erwin, Tenn.	2,965	3,623
Escanaba, Mich.	13,103	14,516
Estherville, Iowa	4,699	4,940
Euclid, Ohio	3,363	12,675
Eugene, Ore.	10,593	18,893
Evansville, Ind.	85,264	103,151
Eveleth, Minn.	7,205	7,485
Excelsior Springs, Mo.	4,165	4,519
Exeter, N. H.	4,604	4,848
Fairfield, Conn.	11,475	17,184
Fairfield, Iowa	5,948	6,607
Fairfield, Me.	4,253	5,138
Fairhaven, Mass.	7,291	10,930
Falmouth, Mass.	3,500	4,195
Fargo, N. D.	22,351	28,609
Faribault, Minn.	11,089	12,766
Farmington, Conn.	3,844	4,529
Farrell, Pa.	15,586	14,359
Fayetteville, Ark.	5,362	7,387
Fayetteville, N. C.	8,877	13,115
Fergus Falls, Minn.	7,581	9,369
Ferguson, Mo.	1,874	3,795
Fernandina, Fla.	5,457	3,024
Ferndale, Mich.	2,640	20,796
Findlay, Ohio	17,021	19,329
Flora, Ill.	3,558	4,377
Floral Park, N. Y.	2,097	9,962
Florence, S. C.	10,968	14,655
Fond du Lac, Wisc.	23,427	26,362
Forest City, Pa.	6,004	5,210
Forest Park, Ill.	10,768	14,545
Forrest Hills, Pa.	.....	4,542
Fort Atkinson, Wisc.	4,915	5,769
Fort Collins, Colo.	8,755	11,149
Fort Dodge, Iowa	19,347	21,860
Fort Edward, N. Y.	3,871	3,848
Fort Kent, Me.	4,237	4,719
Fort Madison, Iowa	12,066	13,677
Fort Pierce, Fla.	2,115	4,772
Fort Smith, Ark.	28,870	31,434
Ft. Wayne, Ind.	86,549	115,121
Fort Worth, Texas	106,482	160,892
Fountain Hill, Pa.	2,339	4,519
Foxboro, Mass.	4,136	5,344
Framingham, Mass.	17,033	22,199
Franklin, Ind.	4,909	5,678
Franklin, Mass.	6,497	7,028
Franklin, N. J.	4,075	4,176
Franklin, Ohio	3,071	4,490
Freeland, Pa.	6,666	7,096
Freeport, Ill.	19,669	22,026
Freeport, N. Y.	8,599	15,364
Frederick, Okla.	2,822	4,554
Fredericksburg, Va.	5,882	6,826
Fresno, Calif.	45,086	52,558
Fullerton, Calif.	4,415	10,820
Fulton, Mo.	5,595	6,030
Fulton, N. Y.	13,043	12,450
Gainesville, Fla.	6,860	10,474
Galesburg, Ill.	23,834	28,702
Galion, Ohio	7,374	7,644
Gallitzin, Pa.	3,580	3,458
Galveston, Texas	44,255	51,939
Garden City, Kan.	3,848	6,117
Garden City, N. Y.	2,420	7,055
Gardiner, Me.	5,475	5,606
Gardner, Mass.	16,971	19,356
Garfield, N. J.	19,381	29,763
Garfield Hghts., O.	2,550	15,575
Georgetown, S. C.	4,579	5,068
Gilberton, Pa.	4,766	4,227
Girardville, Pa.	4,482	4,891
Gladstone, Mich.	4,953	5,164
Glassboro, N. J.	.....	4,760
Glassport, Pa.	6,959	8,380
Glastonbury, Conn.	5,592	5,777
Glencoe, Ill.	3,381	6,290
Glendale, Calif.	13,536	62,607
Glen Ellyn, Ill.	2,851	7,628
Glenolden, Pa.	1,944	4,484
Glens Falls, N. Y.	16,638	18,527
Glenwood, Iowa	3,862	4,269
Globe, Ariz.	7,044	7,143
Goldsboro, N. C.	11,296	14,971
Gouverneur, N. Y	4,143	4,014
Grafton, Mass.	6,887	7,028
Graham, Texas	2,544	4,818

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	1920	1930
Grand Haven, Mich	7,205	8,180
Grand Island, Nebr	13,947	18,041
Grand Lodge, Mich	3,043	3,560
Grand Rapids, Mich	137,634	168,234
Grandview Hghts, O	1,185	6,301
Grants Pass, Ore	3,151	4,659
Grass Valley, Calif	4,006	3,810
Great Barrington, Mass	6,315	5,919
Great Neck, N. Y	.....	4,106
Green Bay, Wisc	31,107	37,327
Greencastle, Ind	3,780	4,603
Gretna, La	7,197	9,481
Greeneville, Tenn	3,775	5,543
Greenfield, Ind	4,168	4,171
Greenfield, Mass	15,463	15,418
Greenfield, Ohio	4,344	3,869
Greensboro, N. C	19,861	53,422
Greensburg, Ind	5,345	5,395
Greensburg, Pa	15,033	16,387
Greenville, Miss	11,560	14,795
Greenville, Pa	8,101	8,629
Greenwich, Conn	22,123	32,159
Greenwood, Miss	7,793	11,095
Griswold, Conn	4,220	6,010
Groton, Conn	9,227	10,388
Gulfport, Miss	8,157	12,522
Guttenberg, N. J	6,726	6,526
Haddonfield, N. J	5,646	8,853
Hagerstown, Md	28,064	29,902
Haledon, N. J	3,435	5,326
Hamburg, N. Y	3,185	4,674
Hamilton, Ohio	39,675	52,108
Hamden, Conn	8,611	20,250
Hammond, La	3,855	6,072
Hammonton, N. J	6,417	7,629
Hampton, Va	6,138	6,383
Hancock, Mich	7,527	5,789
Hanford, Calif	5,888	6,976
Hanover, Pa	8,664	11,803
Harlan, Ky	2,647	4,377
Harlingen, Texas	1,784	9,486
Harrisburg, Pa	75,917	80,284
Harrison, Ark	3,477	3,623
Harrodsburg, Ky	3,765	4,131
Hartford, Conn	138,036	161,372
Hartford, Vt	4,739	4,883
Hartford, Wisc	4,515	3,740
Hartford City, Ind	6,183	6,622
Harvey, Ill	9,216	16,388
Harvey, N. D	1,590	4,156
Hastings, Minn	4,571	5,072
Hastings, Nebr	11,647	15,487
Hastings-on-Hudson, N. Y	5,526	7,038
Hattiesburg, Miss	13,270	18,715
Havelock, Nebr	3,602	3,653
Haverhill, Mass	53,884	48,687
Haverhill, N. H	3,406	3,677
Haverstraw, N. Y	5,226	5,599
Havre de Grace, Md	4,377	3,985
Hawthorne, Calif	.....	6,574
Hawthorne, N. J	5,135	11,965
Hayward, Calif	3,487	5,425
Hazard, Ky	4,348	6,778
Hazelton, Pa	32,277	39,078
Helena, Mont	12,037	11,641
Hempstead, N. Y	6,382	12,663
Henderson, N. C	5,222	6,345
Hermosa Beach, Calif	2,327	4,730
Hibbing, Minn	15,089	15,644
Highland Park, Mich	46,499	52,817
High Point, N. C	14,302	36,708
Highwood, Ill	1,446	3,625
Hillsboro, Ohio	4,356	4,039
Hillsdale, Mich	5,476	5,886
Hingham, Mass	5,604	6,651
Hobart, Okla	2,936	4,980
Hoboken, N. J	68,166	56,523
Holden, Mass	2,970	3,871
Holland, Mich	12,183	14,313
Holyoke, Mass	60,203	56,555
Homewood, Ala	.....	6,078
Honesdale, Pa	2,756	5,483
Hoosick Falls, N. Y	4,896	4,753
Hopkins, Minn	3,055	3,834
Horton, Kan	4,009	4,031
Hot Springs, Ark	11,695	20,115

	1920	1930
Houghton, Mich	4,466	3,667
Houlton, Me	6,191	6,839
Houma, La	5,160	6,534
Houston, Texas	138,276	289,428
Howell, Mich	2,951	3,606
Hubbard, Ohio	3,320	4,083
Hudson, Mass	7,607	8,427
Hudson Falls, N. Y	5,761	6,448
Hugo, Okla	6,368	4,862
Hungtingdon, Pa	7,051	7,552
Hungtington, W. Va	50,177	75,575
Huntington Bch, Calif	1,687	3,616
Huntington Pk., Calif	4,513	24,575
Hunstville, Texas	4,689	5,029
Huron, S. D	8,302	10,744
Independence, Iowa	3,672	3,689
Independence, Mo	11,686	15,261
Indianapolis, Ind	314,194	362,564
Inglewood, Calif	3,286	19,605
Inkster, Mich	.....	4,441
International Falls, Minn	3,448	5,021
Ipswich, Mass	6,201	5,588
Iron River, Mich	4,295	4,665
Ironton, Ohio	14,007	16,600
Ishpeming, Mich	10,500	9,217
Jackson, Mich	48,374	54,870
Jackson, Miss	22,817	47,934
Jacksonville, Fla	91,558	129,682
Jacksonville, Ill	15,713	17,722
Jacksonville, Texas	3,723	6,727
Jamestown, N. Y	38,917	45,172
Jamestown, N. D	6,627	8,147
Janesville, Wisc	18,293	21,427
Jasonville, Ind	4,461	3,536
Jasper, Ind	2,539	3,945
Jeannette, Pa	10,627	15,167
Jeffersonville, Ind	10,098	12,036
Jersey Shore, Pa	6,103	5,791
Jerseyville, Ill	3,839	4,304
Johnson City, N. Y	8,587	13,565
Johnson City, Tenn	12,442	25,073
Johnstown, N. Y	10,908	10,693
Johnstown, Pa	67,327	66,886
Joliet, Ill	38,442	41,753
Junction City, Kan	7,533	7,308
Kalispell, Mont	5,147	6,071
Kansas City, Kan	102,177	122,327
Kaukauna, Wisc	5,951	6,582
Kellogg, Idaho	3,017	4,116
Kendallville, Ind	5,273	5,428
Kenmore, N. Y	3,160	16,460
Kennett, Mo	3,622	4,129
Kenosha, Wisc	40,472	49,844
Kenton, Ohio	7,690	7,066
Keokuk, Iowa	14,423	14,918
Kewanee, Ill	16,026	16,916
Keyport, N. J	4,415	4,889
Killingly, Conn	8,178	8,849
Kingsford, Mich	.....	5,527
Kingston, N. Y	26,688	28,166
Kingsville, Texas	4,770	6,815
Kirksville, Mo	7,213	8,181
Kittery, Me	4,763	4,390
Klamath Falls, Ore	4,801	16,053
Knoxville, Iowa	3,523	4,692
Knoxville, Tenn	77,818	105,797
Kokomo, Ind	30,067	32,680
Lackawanna, N. Y	17,918	23,941
Laconia, N. H	10,897	12,314
LaGrange, Ill	6,525	10,102
La Junta, Colo	4,964	7,197
Lake City, Fla	3,341	4,412
Lake Forest, Ill	3,657	6,137
Lakewood, Ohio	41,732	69,811
Lamar, Colo	2,512	4,233
Lancaster, N. Y	6,059	7,043
Lancaster, Pa	53,150	60,596
Landsdowne, Pa	4,797	7,782
Lanett, Ala	4,976	5,204
Lansdale, Pa	4,728	8,370
Lansford, Pa	9,625	9,632
Lansing, Mich	57,327	78,421
Larchmont, N. Y	2,468	5,314
Las Cruces, N. M	3,969	5,799

	1920	1930
Las Vegas, Nev	2,304	5,177
Latrobe, Pa	9,484	10,633
Laurel, Miss	13,037	17,936
Laurium, Mich	6,696	4,909
Lawrence, Mass	94,270	83,343
Lawrenceburg, Ind	3,466	4,066
Lawrenceville, Ill	5,080	6,293
Lafayette, Ind	22,486	26,165
Leavenworth, Kan	16,912	17,449
Lebanon, Mo	2,848	3,554
Lebanon, N. H	6,162	7,016
Lee, Mass	4,085	4,061
Leesburg, Fla	1,835	4,109
Lehighton, Pa	6,102	6,489
Leicester, Mass	2,635	4,442
Le Mars, Iowa	4,683	4,788
Lenoir City, Tenn	4,210	4,470
Leominster, Mass	19,744	21,083
Lewiston, Idaho	6,574	9,268
Lewiston, Mont	6,120	5,361
Lewistown, Pa	9,849	13,277
Lexington, Ky	41,534	45,723
Lexington, Mass	6,350	9,429
Lexington, Mo	4,695	4,431
Liberty, Mo	3,097	3,513
Libertyville, Ill	2,125	3,787
Lincoln, Nebr	54,948	75,919
Lincoln, R. I	9,543	10,310
Lincoln Park, Mich	.....	12,333
Lincolnton, N. C	3,390	3,777
Linden, N. J	8,368	21,111
Lindenhurst, N. Y	.....	4,040
Lindsay, Calif	2,576	3,881
Lisbon, Me	4,091	3,754
Litchfield, Conn	3,180	3,572
Little Falls, Minn	5,500	5,009
Little Rock, Ark	65,142	81,624
Littleton, N. H	4,239	4,563
Livingston, Mont	6,311	6,357
Lockhart, Texas	3,731	4,366
Lock Haven, Pa	8,557	9,657
Lodi, Calif	4,850	6,759
Logan, Utah	9,439	9,969
Logan, W. Va	2,998	4,395
Lombard, Ill	1,331	6,189
London, Ohio	4,080	4,133
Long Beach, Calif	55,593	141,390
Longmeadow, Mass	2,618	4,432
Longmont, Colo	5,848	5,991
Longview, Texas	5,713	4,991
Lorain, Ohio	37,295	44,471
Los Angeles, Calif	576,673	1,231,730
Louisiana, Mo	4,060	3,567
Louisville, Ky	234,891	307,808
Lubbock, Texas	4,051	20,612
Ludington, Mich	8,810	8,854
Ludlow, Mass	7,470	8,876
Luling, Texas	1,502	5,964
Lynbrook, N. Y	4,371	11,971
Lynn, Mass	99,148	102,293
Lynwood, Calif	.....	7,298
Macomb, Ill	6,714	8,298
Macon, Ga	52,995	53,866
Macon, Mo	3,549	4,000
Madawaska, Me	1,933	3,533
Madera, Calif	3,444	4,665
Madison, Ill	4,996	7,079
Madison, Ind	6,711	6,522
Madison, Iowa	15,020	14,370
Madison, Me	3,700	3,958
Madison, S. D	4,144	4,282
Madison, Wisc	38,378	57,815
Malone, N. Y	7,556	8,647
Manchester, Conn	18,370	21,950
Manchester, N. H	78,384	76,886
Mandan, N. D	4,336	5,010
Mansfield, Mass	6,255	6,354
Mansfield, Ohio	27,824	33,434
Mangum, Okla	2,405	4,775
Manistec, Mich	9,694	8,039
Manitowoc, Wisc	17,563	22,973
Manville, N. J	.....	5,544
Maple Hghts., Ohio	1,732	5,940
Maplewood, Mo	7,431	12,629
Marblehead, Mass	7,324	8,643
Marcus Hook, Pa	5,324	4,579
Marietta, Ga	6,190	7,635
Marietta, Ohio	15,140	14,244

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	1920	1930
Marinette, Wisc.	13,610	13,568
Marion, Ill.	9,582	9,016
Marion, Iowa	4,138	4,321
Marion, Ohio	27,891	31,005
Marlborough, Mass.	15,028	15,594
Marlin, Texas	4,310	5,333
Marseilles, Ill.	3,391	4,293
Marshall, Mo.	5,200	8,080
Marshalltown, Iowa	15,731	17,280
Marshfield, Ore.	4,034	5,286
Martinez, Calif.	3,858	6,305
Martins Ferry, Ohio	11,634	14,525
Marysville, Calif.	5,461	5,760
Marysville, Ohio	3,635	3,631
Maryville, Mo.	4,711	5,213
Massena, N. Y.	5,993	10,633
Mattoon, Ill.	13,552	15,620
Maud, Okla.	637	4,319
Mayfield, Ky.	6,583	8,166
Maywood, Calif.	.....	6,778
Maywood, Ill.	12,072	25,675
McAdoo, Pa.	4,674	5,239
McComb, Miss.	7,775	10,057
McCook, Nebr.	4,303	6,567
McMinnville, Tenn.	2,814	3,897
McPherson, Kan.	4,595	6,138
Meadville, Pa.	14,568	16,595
Mechanicsburg, Pa.	4,688	5,647
Mechanicville, N. Y.	8,166	7,968
Medfield, Mass.	3,595	4,080
Medford, Mass.	39,038	59,700
Medina, Ohio	3,430	4,363
Melrose, Mass.	18,204	23,124
Melrose Park, Ill.	7,147	10,772
Memphis, Tenn.	162,351	252,049
Memphis, Texas	2,839	4,252
Mendota, Ill.	3,934	4,006
Menominee, Mich.	8,907	10,305
Merced, Calif.	3,974	7,063
Meriden, Conn.	34,764	38,452
Meridian, Miss.	23,399	32,527
Merrill, Wisc.	8,068	8,341
Mesa, Ariz.	3,036	3,675
Methuen, Mass.	15,189	21,077
Metropolis, Ill.	5,055	5,570
Mexico, Me.	2,242	4,754
Mexico, Mo.	6,013	8,281
Miami, Ariz.	6,689	7,679
Miami, Okla.	6,802	8,060
Middleborough, Mass.	8,453	8,593
Middleport, Ohio	3,772	3,502
Middlesex, N. J.	1,852	3,511
Middletown, N. Y.	18,420	21,298
Middletown, Ohio	23,594	29,843
Middletown, Pa.	5,920	6,078
Midland, Texas	1,795	5,482
Milford, Conn.	10,193	12,500
Milford, Del.	2,703	3,716
Milford, Mass.	13,471	14,739
Millbury, Mass.	5,653	6,955
Milledgeville, Ga.	4,619	5,534
Millinocket, Me.	4,528	5,829
Milton, Mass.	9,382	16,397
Millville, N. J.	14,691	14,678
Milwaukee, Wisc.	457,147	568,962
Minden, La.	6,105	5,622
Mineola, N. Y.	3,016	8,139
Minersville, Pa.	7,845	9,393
Mingo Junction, O.	4,616	5,031
Mission, Texas	3,847	5,119
Missoula, Mont.	12,668	14,616
Missouri Valley, Ia.	3,985	4,224
Mitchell, S. D.	8,478	10,743
Moberly, Mo.	12,808	13,647
Mobridge, S. D.	3,517	3,517
Modesto, Calif.	9,241	13,847
Moline, Ill.	30,734	32,330
Monaca, Pa.	3,838	4,641
Monessen, Pa.	18,179	20,260
Monmouth, Ill.	8,116	8,782
Monroe, La.	12,675	26,002
Monroe, Mich.	11,573	18,090
Monrovia, Calif.	5,480	10,880
Monson, Mass.	4,826	4,917
Montague, Mass.	7,675	8,071
Montclair, N. J.	28,810	41,496
Montebello, Calif.	.....	5,467
Monterey, Calif.	5,479	9,152
Monterey Park, Calif.	4,108	6,551
Montevideo, Minn.	4,419	4,302
Montgomery, Ala.	43,464	65,801
Montpelier, Ohio	3,052	3,667
Montville, Conn.	3,411	3,962
Mooresville, N. C.	4,315	5,619
Moorhead, Minn.	5,720	7,657
Morgan City, La.	5,429	5,985
Morgantown, W. Va.	12,127	16,169
Morrisville, Pa.	3,639	5,363
Moscow, Idaho	3,956	4,415
Moultrie, Ga.	6,789	7,912
Mt. Carmel, Ill.	7,456	7,120
Mount Carmel, Pa.	17,469	17,963
Mt. Clemens, Mich.	9,488	13,456
Mt. Healthy, Ohio	2,255	3,530
Mount Kisco, N. Y.	3,944	5,035
Mt. Oliver, Pa.	5,575	7,072
Mount Pleasant, Ia.	3,987	3,654
Mount Pleasant, Pa.	5,862	5,863
Mt. Ranier, Md.	2,462	3,797
Mt. Sterling, Ky.	3,995	4,340
Mount Union, Pa.	4,744	4,893
Mt. Vernon, Ind.	5,284	5,037
Mount Vernon, N.Y.	42,726	60,869
Mt. Vernon, Wash.	3,341	3,686
Munhall, Pa.	6,418	12,993
Munsing, Mich.	5,037	3,945
Murphysboro, Ill.	10,703	8,262
Muscatine, Iowa	16,068	16,770
Muskegon, Mich.	36,570	41,338
Muskegon Heights, Mich.	9,514	15,546
Muskogee, Okla.	30,277	31,988
Nacogdoches, Texas	3,546	5,686
Nantucket, Mass.	2,797	3,646
Nanty Glo, Pa.	5,028	5,598
Napa, Calif.	6,757	6,433
Narberth, Pa.	3,704	4,663
Natchez, Miss.	12,608	13,388
Natick, Mass.	10,907	13,510
Naugatuck, Conn.	15,051	14,277
Nebraska City, Nebr.	6,279	7,221
Needham, Mass.	7,012	10,833
Neenah, Wisc.	7,171	9,151
Negaunee, Mich.	7,419	6,552
Nelsonville, Ohio	6,440	5,229
New Albany, Ind.	22,992	25,825
Newark, Del.	2,183	3,899
Newark, Ohio	26,718	30,471
New Bedford, Mass.	121,217	112,804
Newburgh, N. Y.	30,366	31,240
Newburgh Hghts, O.	2,957	4,150
Newburyport, Mass.	15,618	15,059
New Boston, Ohio	4,817	5,931
New Braunfels, Tex.	3,590	6,241
New Britain, Conn.	59,316	67,843
New Brunswick, N.J.	32,779	34,273
New Canaan, Conn.	3,395	5,431
New Castle, Del.	3,854	4,131
New Castle, Ind.	14,458	13,966
New Cumberland, Pa	1,577	4,283
New Haven, Conn.	162,537	162,650
Newington, Conn.	2,381	4,569
New Kensington, Pa.	11,987	16,742
New Lexington, O.	3,157	3,888
New Milford, Conn.	4,781	4,833
New Orleans, La.	387,219	451,624
Newport, Ark.	3,771	4,402
Newport, N. H.	4,109	4,651
Newport, R. I.	30,255	27,430
Newport, Tenn.	2,753	3,968
Newport, Vt.	4,976	5,077
Newport News, Va.	35,506	34,285
New Rochelle, N. Y.	36,213	54,055
Newton, Iowa	6,627	11,550
Newton, Mass.	46,054	65,295
Newton, N. J.	4,125	5,404
New Ulm, Minn.	6,745	7,304
New York, N. Y.	5,620,048	6,959,195
New York Mills, N.Y.	.....	4,002
Niles, Mich.	7,311	11,317
Niles, Ohio	13,080	16,313
Niles Center, Ill.	753	4,986
Noosho, Mo.	3,968	4,472
Norfolk, Va.	115,777	127,808
Normal, Ill.	5,143	6,765
Norman, Okla.	5,004	9,597
Norristown, Pa.	32,319	35,837
North Andover, Mass	6,265	6,934
North Arlington, N.J.	1,767	8,356
No. Attleboro, Mass.	9,238	10,150
North Braddock, Pa.	14,928	16,766
Northbridge, Mass.	10,174	9,678
No. College Hill, O.	1,104	4,139
Northeast, Pa.	3,481	3,659
Northfield, Minn.	4,023	4,149
North Haven, Conn.	1,968	3,502
No. Little Rock, Ark.	14,048	19,413
North Pelham, N. Y.	2,385	4,737
No. Plainfield, N. J.	6,916	9,720
North Platte, Nebr.	10,463	12,063
Norwalk, Conn.	27,743	35,961
Norwich, Conn.	22,304	22,776
Norwich, N. Y.	8,268	8,377
Norwood, Mass.	12,627	14,983
Norwood, Ohio	24,966	33,367
Nowata, Okla.	4,435	3,507
Nutley, N. J.	9,421	20,442
Nyack, N. Y.	4,444	5,389
Oklahoma City, Okla.	91,235	182,845
Oakland, Calif.	216,261	284,213
Oakmont, Pa.	4,512	6,021
Oak Park, Ill.	39,858	63,819
Oakwood, Ohio	1,473	6,467
Oberlin, Ohio	4,236	4,281
Ocean City, N. J.	2,512	5,463
Oconomowoc, Wisc.	3,301	4,190
Ogden, Utah	32,804	40,243
Ogdensburg, N. Y.	14,609	16,904
Oglosby, Ill.	4,135	3,910
Oil City, Pa.	21,274	22,048
Okemah, Okla.	2,162	4,001
Olathe, Kan.	3,268	3,652
Old Town, Me.	6,956	7,265
Olean, N. Y.	20,506	21,350
Olney, Ill.	4,491	6,140
Olney, Texas	1,164	4,132
Omaha, Nebr.	191,601	214,175
Oneida, N. Y.	10,541	10,559
Ontario, Calif.	7,280	13,570
Opelika, Ala.	4,960	6,148
Opelousas, La.	4,437	6,279
Orange, Calif.	4,884	8,029
Orange, N. J.	33,268	34,958
Orangeburg, S. C.	7,290	8,764
Orlando, Fla.	9,282	27,263
Oroville, Calif.	3,340	3,702
Orrville, Ohio	4,107	4,426
Ossining, N. Y.	10,739	16,581
Ottawa, Ill.	10,816	15,042
Ottumwa, Iowa	23,003	27,851
Owego, N. Y.	4,147	4,739
Oxford, Mass.	3,820	3,943
Oxford, N. C.	3,606	4,100
Oxnard, Calif.	4,417	6,210
Pacific Grove, Calif.	2,974	5,554
Painesville, Ohio	7,272	10,968
Palatka, Fla.	5,102	6,397
Palestine, Texas	11,039	11,429
Palmer, Mass.	9,896	9,575
Palo Alto, Calif.	5,900	13,635
Pampa, Texas	987	10,453
Pana, Ill.	5,815	6,122
Panama City, Fla.	1,722	5,386
Paris, Me.	3,656	3,749
Paris, Texas	15,040	15,406
Parkersburg, W. Va.	20,050	29,605
Parma, Ohio	.....	13,811
Parnassus, Pa.	3,816	6,136
Pasadena, Calif.	45,354	75,875
Pascagoula, Miss.	6,082	4,240
Passaic, N. J.	63,841	63,108
Patchogue, N. Y.	4,031	6,860
Paterson, N. J.	135,875	138,267
Peabody, Mass.	19,552	21,112
Peekskill, N. Y.	15,868	17,439
Pekin, Ill.	12,086	16,096
Pelham Manor, N. Y.	1,754	4,922
Pella, Iowa	3,338	3,726
Penbrook, Pa.	2,072	3,550
Pennsgrove, N. J.	6,060	5,894
Pensacola, Fla.	31,035	31,455
Peoria, Ill.	76.121	104,788
Perkasie, Pa.	3,150	3,463
Perry, Iowa	5,642	5,929

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	1920	1930
Perth Amboy, N. J.	41,707	43,953
Peru, Ill.	8,869	9,121
Pertaluma, Calif.	6,226	8,238
Petersburg, Va.	31,012	28,487
Philadelphia, Pa.	1,823,779	1,963,000
Phillipsburg, N J.	16,923	19,254
Philipsburg, Pa.	3,900	3,594
Phoenixville, Pa.	10,484	11,944
Picayune, Miss.	2,479	4,700
Picrre, S. D.	3,209	3,656
Pitcairn, Pa.	5,738	6,315
Pittsburg, Calif.	4,715	9,598
Pittsburgh, Pa.	588,343	644,795
Pittston, Pa.	18,497	18,250
Plainfield, Conn.	7,926	8,023
Plainfield, N. J.	27,700	34,405
Plainview, Texas	3,989	8,834
Plainville, Conn.	4,114	6,299
Plant City, Fla.	3,729	6,811
Plattsburg, N. Y.	10,909	13,333
Plattsmouth, Nebr.	4,190	3,769
Pleasantville, N. J.	5,887	11,553
Pleasantville, N. Y.	3,590	4,558
Plymouth, Conn.	5,942	6,055
Plymouth, Mass.	13,045	12,968
Plymouth, Mich.	2,857	4,470
Plymouth, Wisc.	3,415	3,882
Pocatello, Idaho	15,001	16,352
Pomeroy, Ohio	4,294	3,559
Ponoma, Calif.	13,505	20,695
Pontiac, Ill.	6,664	8,255
Poplar Bluff, Mo.	8,042	7,498
Portage, Pa.	4,804	4,433
Port Angeles, Wash.	5,351	10,052
Port Arthur, Texas	22,251	49,107
Port Chester, N. Y.	16,573	22,412
Port Clinton, Ohio	3,928	4,406
Porterville, Calif.	4,097	5,303
Port Jervis, N. Y.	10,171	10,230
Portland, Conn.	3,644	4,054
Portland, Me.	69,272	70,452
Portsmouth, N. H.	13,569	13,701
Portsmouth, Ohio	33,011	42,536
Portsmouth, Va.	54,387	45,353
Port Townsend, Wash.	2,847	3,890
Port Vue, Pa.	2,538	3,506
Port Washington, Wisc.	3,340	3,692
Potsdam, N. Y.	4,039	4,136
Poughkeepsie, N. Y.	35,000	40,123
Presque, Isle, Me.	5,581	6,958
Preston, Conn.	2,743	3,928
Price, Utah	2,364	4,062
Prichard City, Ala.	.....	4,583
Princeton, Ill.	4,126	4,582
Princeton, Ind.	7,132	7,484
Princeton, N. J.	5,917	6,939
Prospect Park, N. J.	4,292	5,844
Prospect Park, Pa.	2,536	4,626
Providence, R. I.	237,595	251,029
Provincetown, Mass.	4,246	3,740
Pueblo, Colo.	43,050	50,102
Punxsutawney, Pa.	10,311	9,260
Puyallup, Wash.	6,323	6,689
Putnam, Conn.	7,711	7,308
Quincy, Ill.	35,978	39,221
Quincy, Mass.	47,876	71,965
Quitman, Ga.	4,393	4,149
Racine, Wisc.	58,593	57,515
Rahway, N. J.	11,042	15,973
Raleigh, N. C.	24,418	37,512
Randolph, Mass.	4,756	6,550
Rankin, Pa.	7,301	7,956
Rapid City, S. D.	5.777	10,405
Raritan, N. J.	4,457	4,900
Ravenna, Ohio	7,219	8,123
Rayne, La.	2,720	3,710
Reading, Mass.	7,439	9,747
Reading, Ohio	4,540	5,723
Reading, Pa.	107,784	110,289
Redding, Calif.	2,962	4,188
Redlands, Calif.	9,571	14,130
Red Lion, Pa.	3,198	4,754
Red Oak, Iowa	5,578	5,775
Redondo Beach, Calif.	4,913	9,239
Red Wing, Minn.	8,637	9,628
Redwood, Calif.	4,020	8,957
Rensselaer, N. Y.	10,823	11,213
Revere, Mass.	28,823	35,705
Rhinelander, Wisc.	6,654	8,017
Rice Lake, Wisc.	4,457	5,156
Richmond, Calif.	16,843	19,945
Richmond, Ky.	5,622	6,482
Richmond, Ill.	26,765	32,561
Richmond, Mo.	4,409	4,127
Richmond, Va.	171,667	182,883
Richmond Hghts, Mo.	2,136	9,132
Ridgefield, Conn.	2,707	3,552
Ridgefield, N. J.	8,575	10,748
Ridgway, Pa.	6.037	6,298
Ripon, Wisc.	3,929	3,980
River Forest, Ill.	4,358	8,901
River Rouge, Mich.	9,822	17,290
Riverside, Calif.	19,341	30,654
Riverside, Ill.	2,532	6,660
Robbinsdale, Minn.	13,722	20,626
Robinson, Ill.	3,375	3,613
Robstown, Texas	948	4,183
Rochelle, Ill.	3,310	3,782
Rochester, Minn.	13,722	20,626
Rochester, N. H.	9,673	10.206
Rochester, N. Y.	295,750	325,019
Rock Falls, Ill.	2,927	3,848
Rockford, Ill.	65,651	84,954
Rockingham, Vt.	6,231	5,288
Rockport, Mass.	3,878	3,591
Rockville, Conn.	7,726	7,432
Rockville Ctr. N. Y.	6,262	13,672
Rocky River, Ohio	1,861	5,616
Rolla, Mo.	2,077	3,646
Roselle, N. J.	5,737	13,004
Roseville, Mich.	.....	6,837
Rumford, Me.	8,576	10,335
Rushville, Ill.	2,927	3,848
Rushville, Ind.	5,498	5,722
Rusk, Texas	2,348	3,869
Russellville, Ark.	4,505	5,628
Rye, N. Y.	5,308	8,559
Saco, Me.	6,817	7,227
Sacramento, Calif.	65,908	93,685
St. Albans, Vt.	7,588	8,017
St. Augustine, Fla.	6,192	11,930
St. Bernard, Ohio	6,312	7,484
St. Charles, Mo.	8,503	10,486
St. Clair, Pa.	6,495	7,225
St. Clair Shores, Mich.	.....	6,728
St. Cloud, Minn.	15,873	20,991
St. Johnsbury, Vt.	8,708	9,656
St. Joseph, Mich.	7,251	8,340
St. Louis Park, Minn.	2,281	4,744
St. Louis, Mo.	772,897	817,334
St. Peter, Minn.	4,335	4,736
Salem, Mass.	42,529	43,287
Salem, N. J.	7,435	8,047
Salida, Colo.	4,689	5,045
Salina, Kan.	15,085	20,156
Salinas, Calif.	4,308	10,260
San Angelo, Texas	10,050	25,304
San Antonio, Texas	161,379	254,562
San Benito, Texas	5,070	8,719
San Bernardino, Cal.	18,721	37,453
San Bruno, Calif.	1,562	3,609
San Diego, Calif.	74,683	147,897
Sand Springs, Okla.	4,076	6,632
Sandusky, Ohio	22,897	24,570
San Fernando, Calif.	3,204	7,559
Sanford, Me.	10,691	13,385
San Francisco, Calif.	506,676	625,974
San Gabriel, Calif.	2,640	7,221
San Jose, Calif.	39,642	57,547
San Leandro, Calif.	5,703	11,315
San Luis Obispo, Calif.	5,895	8,264
San Marcos, Texas	4,527	5,134
San Marino, Calif.	584	3,719
San Mateo, Calif.	5,979	13,439
San Rafael, Calif.	5,512	8,023
Santa Ana, Calif.	15,485	30,166
Santa Barbara, Calif.	19,441	33,544
Santa Clara, Calif.	5,220	6,303
Santa Cruz, Calif.	3,943	7,135
Santa Fe, N. M.	7,236	10,884
Santa Maria, Calif.	3,943	7,135
Santa Monica, Calif.	15,252	36,993
Santa Paula, Calif.	3,967	7,395
Sapulpa, Okla.	11,634	10,534
Saratoga Spgs., N.Y.	13,181	13,159
Saugerties, N. Y.	4,013	4,049
Saugus, Mass.	10,874	14,574
Sault Ste. Marie, Mich.	12,096	13,552
Sausalito, Calif.	2,790	3,661
Savanna, Ill.	5,237	5,085
Sayre, Pa.	8,078	7,902
Sayreville, N. J.	.....	8,642
Schuylkill Haven, Pa.	5,437	6,510
Scottsbluff, Nebr.	6,912	8,474
Seattle, Wash.	315,312	362,426
Secaucus, N. J.	5,423	8,948
Seguin, Texas	3,631	5,196
Seminole, Okla.	854	10,332
Sewickley, Pa.	4,955	5,581
Seymour, Ind.	7,348	7,493
Shadyside, Ohio	3,084	4,098
Shaker Hghts, Ohio	1,616	17,892
Sharon, Pa.	21,747	25,863
Sharpsburg, Pa.	8,921	8,631
Shawnee, Okla.	15,348	23,276
Sheboygan, Wisc.	30,955	39,236
Shelby, Ohio	5,578	6,198
Shelbyville, Ind.	9,701	10,602
Shelbyville, Tenn.	2,912	5,007
Shenandoah, Iowa	5,255	6,519
Shillington, Pa.	2,175	4,402
Shorewood, Wisc.	2,650	13,385
Shreveport, La.	43,874	76,659
Shrewsbury, Mass.	3,708	6,905
Sidney, Ohio	6,607	9,289
Sierre Madre, Calif.	2,026	3,514
Sikeston, Mo.	3,613	5,668
Silver City, N. M.	2,662	3,515
Simsbury, Conn.	2,958	3,624
Sioux Falls, S. D.	25,202	33,360
Skowhegan, Me.	5,981	6,431
Solvay, N. Y.	7,352	7,963
Somersworth, N. H.	6,688	5,642
Somerville, Mass.	93,091	103,694
South St. Paul, Minn.	6,860	10,001
Southbridge, Mass.	14,245	14,262
South Charleston, W. Va.	3,650	5,904
South Euclid, Ohio	1,605	4,194
South Hadley, Mass.	5,627	6,772
South Haven, Mich.	3,829	4,885
Southington, Conn.	8,440	9,245
So. Jacksonville, Fla.	2,775	5,654
South Orange, N. J.	7,274	13,739
South Pasadena, Calif.	7,652	13,724
South Portland, Me.	9,254	13,819
South River, N. J.	6,596	8,502
So. San Francisco, Calif.	4,411	6,166
So. Williamsport, Pa.	4,341	5,158
Sparta, Wisc.	5,566	4,917
Spartanburg, S. C.	22,638	28,643
Spencer, Iowa	4,599	4,944
Spencer, Mass.	5,930	6,273
Spokane, Wash.	104,437	115,514
Springfield, Mass.	129,614	149,861
Springfield, Ohio	60,840	68,406
Springfield, Vt.	7,202	6,939
Spring Valley, Ill.	6,493	5,272
Springfield, Utah	3,010	3,748
Stafford, Conn.	5,407	5,943
Stamford, Conn.	35,096	46,282
Stamford, Texas	3,704	4,082
Statesville, N. C.	7,895	10,491
Steelton, Pa.	13,428	13,285
Sterling, Colo.	6,415	7,184
Sterling, Ill.	8,182	10,013
Steubenville, Ohio	28,508	35,418
Stillwater, Minn.	7,735	7,083
Stoneham, Mass.	7,873	10,058
Stonington, Conn.	10,236	11,030
Stoughton, Mass.	6,865	8,192
Stratford, Conn.	12,347	18,588
Struthers, Ohio	5,847	11,300
Sturgis, Mich.	5,995	6,940
Stuttgart, Ark.	4,522	4,906
Suffern, N. Y.	3,154	3,730
Suffield, Conn.	4,070	4,342
Sullivan, Ind.	4,489	5,304
Sulphur, Okla.	3,667	4,239
Summit, Ill.	4,019	6,553
Summit, N. J.	10,174	14,457

Population of United States: Census of 1930 and 1920

	1920	1930
Summit Hill, Pa.	5,499	5,569
Sumter, S. C.	9,508	11,723
Sunbury, Pa.	15,721	15,626
Superior, Wisc.	39,671	36,087
Swampscott, Mass.	8,101	10,328
Swansea, Mass.	2,334	3,937
Sweetwater, Texas	4,307	10,844
Swissvale, Pa.	10,908	15,975
Sylacauga, Ala.	2,141	4,111
Syracuse, N. Y.	171,717	207,007
Tacoma, Wash.	96,965	106,837
Tallahassee, Fla.	5,637	10,744
Tamaqua, Pa.	12,363	12,933
Tampa, Fla.	51,608	100,910
Tarentum, Pa.	8,925	9,539
Tarrant City, Ala.	2,098	7,341
Tarrytown, N. Y.	5,807	6,740
Taunton, Mass.	37,137	37,288
Taylor, Texas	5,965	7,459
Taylorville, Ill.	5,806	7,229
Temple, Texas	11,033	15,332
Terre Haute, Ind.	66,083	62,543
Tewksbury, Mass.	4,450	5,585
Texarkana, Texas	11,480	16,602
Texas City, Texas	2,509	3,534
The Dalles, Ore.	5,807	5,882
Thibodaux, La.	3,526	4,401
Thomaston, Conn.	3,993	4,173
Thomasville, Ga.	8,196	11,725
Thompson, Conn.	5,055	4,997
Three Rivers, Mich.	5,209	6,823
Ticonderoga, N. Y.	2,102	3,680
Toccoa, Ga.	3,567	4,602
Titusville, Pa.	8,432	7,970
Toledo, Ohio	243,164	290,787
Topeka, Kan.	50,022	64,005
Toronto, Ohio	4,684	7,036
Torrance, Calif.	.....	7,266
Torrington, Conn.	22,055	26,072
Totowa, N. J.	1,864	4,541
Towanda, Pa.	4,269	4,103
Tracy, Calif.	2,450	3,822
Trafford, Pa.	2,859	4,200
Traverse City, Mich.	10,925	12,506
Trenton, Mo.	6,951	6,980
Trenton, N. J.	119,289	122,610
Trinidad, Colo.	10,906	11,715
Troy, N. Y.	72,013	72,350
Trumbull, Conn.	2,597	3,619
Tuckahoe, N. Y.	3,509	6,203
Tulare, Calif.	3,539	6,202
Tullahoma, Tenn.	3,479	4,020
Tulsa, Okla.	72,075	140,531
Tupper Lake, N. Y.	2,508	5,266
Turlock, Calif.	3,394	4,256
Turtle Creek, Pa.	8,138	10,684
Tuskegee, Ala.	2,475	3,986
Two Harbors, Minn.	4,564	4,388
Two Rivers, Wisc.	7,305	10,048
Tyler, Texas	12,085	17,089
Tyrone, Pa.	9,084	9,109
Union City, N. J.	60,725	58,588
Union City, Pa.	3,850	3,780
University, Mo.	6,792	25,717
Upland, Calif.	2,912	4,737
Upper Sandusky, O.	3,708	3,885
Urbana, Ill.	10,244	13,058
Urbana, Ohio	7,621	7,714
Uxbridge, Mass.	5,384	6,285
Vallejo, Calif.	16,845	14,385
Valley Junction, Iowa	3,631	4,278
Valley Stream, N. Y.	.....	11,767
Valparaiso, Ind.	6,518	8,049
Van Buren, Ark.	5,224	5,182
Van Buren, Me.	4,594	4,721
Vancouver, Wash.	12,637	15,759
Vandalia, Ill.	3,316	4,341
Ventnor, N. J.	2,193	6,638
Ventura, Calif.	4,342	11,432
Vernon, Conn.	8,898	8,690
Vernon, Texas	5,142	9,107
Verona, N. J.	2,039	7,052
Verona, Pa.	3,938	4,375
Victoria, Texas	5,957	7,522
Vidalia, Ga.	2,860	3,584
Villa Park, Ill.	854	6,215
Vincennes, Ind.	17,160	17,532
Vineland, N. J.	6,799	7,541
Vinita, Okla.	5,010	4,263
Virginia, Minn.	14,022	11,957
Visalia, Calif.	5,753	7,252
Wabash, Ind.	9,872	8,915
Wadsworth, Ohio	4,742	5,930
Wakefield, Mass.	13,025	15,973
Walden, N. Y.	5,493	4,280
Wallace, Idaho	2,816	3,529
Wallingford, Conn.	12,010	14,283
Walpole, Mass.	5,446	7,273
Walsenburg, Colo.	3,565	5,507
Waltham, Mass	30,915	39,425
Ware, Mass.	8,525	7,386
Wareham, Mass.	4,415	5,677
Warren, Iowa	18,047	17,683
Warren, Mass.	3,467	3,761
Warren, Ohio	27,050	41,054
Warren, Pa.	14,272	14,835
Warrensburg, Mo.	4,811	5,146
Warwick, R. I.	13,481	23,011
Washington, Mo.	2,132	5,905
Washington, N. J.	3,341	4,211
Washington, N. C.	6,314	7,031
Washington Court House, Ohio	7,962	8,415
Washington Park, Ill.	1,516	3,841
Waterbury, Vt.	3,542	4,038
Waterford, Conn.	3,935	4,732
Waterford, N. Y.	5,493	4,280
Waterloo, Iowa	36,230	45,969
Watertown, Mass.	21,457	34,860
Waterville, Me.	13,351	15,330
Watervliet, N. Y.	16,073	15,781
Watsonville, Calif.	5,013	8,327
Waukegan, Ill.	19,226	33,434
Waukesha, Wisc.	12,558	17,174
Waupon, Wisc.	4,440	5,763
Waverly, Iowa	3,352	3,649
Waverly, N. Y.	5,270	5,664
Waynesboro, Va.	1,594	6,222
Webster City, Iowa	5,657	7,024
Webster Groves, Mo.	9,474	16,462
Welch, W. Va.	3,232	5,494
Wellesley, Mass.	6,224	11,427
Wellington, Kan.	7,048	7,402
Wellsboro, Pa.	3,452	3,642
Wellsburg, W. Va.	4,918	5,539
Wellston, Ohio	6,687	5,319
Wellsville, N. Y.	4,996	5,678
Weslaco, Texas	.....	4,464
West Allis, Wisc.	13,745	34,617
West End, Wisc.	3,378	4,760
Westborough, Mass.	5,789	6,409
Westbrook, Me.	9,453	10,806
Westfield, Mass.	18,604	19,772
Westfield, N. J.	9,063	15,718
Westford, Mass.	3,170	3,598
West Hartford, Conn.	8,854	24,936
West Haven, Conn.	16,614	25,654
West Hazelton, Pa.	5,854	7,308
West Helena, Ark.	6,226	4,491
West Homestead, Pa.	3,435	3,547
West Lafayette, Ind.	3,830	5,085
West Milwaukee, Wis.	2,101	4,105
Westminster, Md.	3,521	4,464
West New York, N. J.	29,926	36,941
West Orange, N. J.	15,573	23,998
Westport, Conn.	5,114	5,826
Westport, Mass.	3,115	4,392
West Reading, Pa.	2,921	4,908
West St. Paul, Minn.	2,962	4,463
West Springfield, Mass.	13,443	16,683
West Terre Haute, Ind.	4,310	3,578
West View, Pa.	2,797	6,028
Wethersfield, Conn.	4,342	7,507
Wewoka, Okla.	1,520	10,023
Weymouth, Mass.	15,057	20,799
Wharton, N. J.	2,877	3,686
Wheaton, Ill.	4,137	7,164
Wheeling, W. Va.	56,208	61,752
Wichita, Kan.	72,217	109,832
Whitehall, N. Y.	5,258	5,194
White Plains, N. Y.	21,031	35,604
Whiting, Ind.	10,145	10,755
Whitman, Mass.	7,147	7,636
Whittier, Calif.	7,997	14,808
Wildwood, N. J.	2,790	5,289
Wilkinsburg, Pa.	24,403	29,565
Willard, Ohio	3,889	4,507
Williamsburg, Va.	2,462	3,660
Williamson, W. Va.	6,819	9,410
Williamsport, Pa.	36,198	45,695
Williamstown, Mass.	3,707	3,889
Willimantic, Conn.	12,330	12,071
Williston Park, N. Y.	.....	4,414
Willmar, Minn.	5,892	6,139
Wilmerding, Pa.	6,441	6,287
Wilmette, Ill.	7,814	15,171
Wilmington, Del.	110,168	104,941
Wilmington, Mass.	2,581	4,019
Wilmington, N. C.	33,372	32,167
Wilmington, Ohio	5,037	5,329
Willoughby, Ohio	2,656	4,271
Wilson, Pa.	.....	8,252
Winchendon, Mass.	5,904	6,199
Winchester, Ind.	4,021	4,486
Winchester, Mass.	10,485	12,654
Winchester, Va.	6,883	10,844
Windham, Conn.	13,801	13,743
Windsor, Conn.	5,620	8,294
Windsor, Vt.	3,687	4,240
Winnetka, Ill.	6,694	12,084
Winona, Minn.	19,143	20,852
Winooski, Vt.	4,932	5,300
Winslow, Ariz.	3,730	3,905
Winslow, Me.	3,280	3,915
Winston-Salem, N.C.	48,395	75,272
Winter Haven, Pa.	1,597	7,118
Winter Park, Fla.	1,078	3,646
Woburn, Mass.	16,574	19,427
Woodstock, Ill.	5,523	5,466
Wooster, Ohio	8,204	10,764
Worcester, Mass.	179,754	196,395
Worthington, Minn.	3,481	3,878
Wrentham, Mass.	2,808	3,587
Wyandotte, Mich.	13,851	28,294
Wynne, Ark.	2,933	3,505
Wyoming, Ohio	2,323	3,764
Yankton, S. D.	5,024	6,074
Yazoo City, Miss.	5,244	5,553
Yeadon, Pa.	1,308	5,411
York, Pa.	47,512	55,230
Youngstown, Ohio	132,358	170,004
Ypsilanti, Mich.	7,413	10,137
Yuba City, Calif.	1,708	3,606
Yuma, Ariz.	4,237	4,765
Zion, Ill.	5,580	5,995

POPULATION OF CITIES OF UNITED STATES, OVER 50,000

CENSUS OF 1920

City.	1920.	1910.
Akron, O	208,435	69,067
Albany, N. Y	113,344	100,253
Allentown, Pa	73,502	51,913
Altoona, Pa	60,331	52,127
Atlanta, Ga	200,616	154,839
Atlantic City, N. J	50,682	46,150
Augusta, Ga	52,548	41,040
Baltimore, Md	733,826	558,485
Bayonne, N. J	76,754	55,545
Berkeley, Cal	55,886	40,434
Bethlehem, Pa	50,358	12,837
Binghamton, N. Y	66,800	48,443
Birmingham, Ala	178,270	132,685
Boston, Mass	748,060	670,585
Bridgeport, Conn	143,538	102,054
Brockton, Mass	66,138	56,878
Buffalo, N. Y	506,775	423,715
Cambridge, Mass	109,694	104,839
Camden, N. J	116,309	94,538
Canton, O	87,091	50,217
Charleston, S. C	67,957	58,833
Chattanooga, Tenn	57,895	44,604
Chester, Pa	58,030	38,537
Chicago, Ill	2,701,705	2,185,283
Cincinnati, O	401,247	362,591
Cleveland, O	796,836	560,663
Columbus, O	237,031	181,511
Covington, Ky	57,121	53,270
Dallas, Tex	158,976	92,104
Davenport, Ia	56,727	43,028
Dayton, O	152,559	116,577
Denver, Colo	256,369	213,381
Des Moines, Ia	126,468	86,368
Detroit, Mich	993,739	405,766
Duluth, Minn	98,917	78,466
East Orange, N. J	50,710	34,371
East St. Louis, Ill	66,740	58,547
Elizabeth, N. J	95,682	73,409
El Paso, Tex	77,543	39,279
Erie, Pa	93,372	66,525
Evansville, Ind	85,264	69,647
Fall River, Mass	120,485	119,295
Flint, Mich	91,599	38,550
Fort Wayne, Ind	86,549	63,933
Forth Worth, Tex	106,482	73,312
Gary, Ind	55,378	16,802
Grand Rapids, Mich	137,634	112,571
Harrisburg, Pa	75,917	64,186
Hartford, Conn	138,036	98,915
Haverhill, Mass	53,884	44,115
Hoboken, N. J	68,166	70,324
Holyoke, Mass	60,203	57,730
Honolulu, Hawaii	83,327	52,183
Houston, Tex	138,076	78,800
Huntington, W. Va	50,177	31,161
Indianapolis, Ind	314,194	233,650
Jacksonville, Fla	91,558	57,699
Jersey City, N. J	297,864	267,779
Johnstown, Pa	67,327	55,482
Kansas City, Kas	101,177	82,331
Kansas City, Mo	324,410	248,381
Knoxville, Tenn	77,818	36,346
Lancaster, Pa	53,150	47,227
Lansing, Mich	57,327	31,229
Lawrence, Mass	94,270	85,892
Lincoln, Neb	54,934	44,103
Little Rock, Ark	64,997	45,941
Long Beach, Cal	55,593	17,809
Los Angeles, Cal	576,673	319,198
Louisville, Ky	234,891	223,928
Lowell, Mass	112,759	106,294
Lynn, Mass	99,148	89,336
Macon, Ga	52,995	40,665
Manchester, N. H	78,384	70,063
Memphis, Tenn	162,351	131,105
Milwaukee, Wis	457,147	373,857
Minneapolis, Minn	380,582	301,408
Mobile, Ala	60,151	51,521
Nashville, Tenn	118,342	110,364
Newark, N. J	414,216	347,469
New Bedford, Mass	121,217	96,652
New Britain, Conn	59,316	43,916
New Haven, Conn	162,519	133,605
New Orleans, La	387,219	339,075
New York, N. Y	5,621,151	4,766,883
Niagara Falls, N. Y	50,760	30,445
Norfolk, Va	115,777	67,452
Oakland, Cal	216,361	150,174
Oklahoma City, Okla	91,258	64,205
Omaha, Neb	191,601	124,096
Passaic, N. J	63,824	54,773
Paterson, N. J	135,866	125,600
Pawtucket, R. I	64,248	51,622
Peoria, Ill	76,121	65,950
Philadelphia, Pa	1,823,158	1,549,008
Pittsburgh, Pa	588,193	533,905
Portland, Me	69,272	58,571
Portland, Ore	258,288	207,214
Portsmouth, Va	54,387	33,190
Providence R. I	237,595	224,326
Racine, Wis	58,593	38,002
Reading, Pa	107,784	96,071
Richmond, Va	171,667	127,028
Roanoke, Va	50,842	34,874
Rochester, N. Y	295,750	218,149
Rockford, Ill	65,651	45,401
Sacramento, Cal	65,857	44,696
Saginaw, Mich	61,903	50,510
St. Joseph, Mo	77,939	77,403
St. Louis, Mo	772,897	687,029
St. Paul, Minn	234,595	214,744
Salt Lake City, Utah	118,110	92,277
San Antonio, Tex	161,379	96,612
San Diego, Cal	74,683	39,578
San Francisco, Cal	508,410	416,912
Savannah, Ga	83,252	65,064
Schenectady, N. Y	88,723	72,826
Scranton, Pa	137,783	129,867
Seattle, Wash	315,650	237,194
Sioux City, Ia	71,227	47,828
Somerville, Mass	93,091	77,236
South Bend, Ind	70,983	53,684
Spokane, Wash	104,437	104,402
Springfield, Ill	59,183	51,678
Springfield, Mass	129,563	88,926
Springfield, O	60,840	46,921
Syracuse, N. Y	171,717	137,249
Tacoma, Wash	96,965	83,743
Tampa, Fla	51,252	37,782
Terre Haute, Ind	66,083	58,157
Toledo, O	243,109	168,497
Topeka, Kas	50,022	43,684
Trenton, N. J	119,289	98,815
Troy, N. Y	72,018	76,813
Tulsa, Okla	72,075	18,182
Utica, N. Y	94,156	74,419
Washington, D. C	437,571	331,069
Waterbury, Conn	91,410	73,141
Wheeling, W. Va	54,322	41,641
Wichita, Kas	72,128	52,450
Wilkes-Barre, Pa	73,828	67,105
Wilmington, Del	110,168	87,411
Worcester, Mass	179,754	145,986
Yonkers, N. Y	100,226	79,803
Youngstown, O	132,358	79,066

POPULATION OF THE CONTINENTAL UNITED STATES AND OUTLYING POSSESSIONS, 1920, 1910, AND 1900

State.	Population.			Increase,[1] 1910–1920.		Increase,[1] 1900–1910.	
	1920.	1910.	1900.	Number.	Per Cent.	Number.	Per Cent.
Alabama	2,348,174	2,138,093	1,828,697	210,081	9.8	309,396	16.9
Arizona	333,903	204,354	122,931	129,549	63.4	81,423	66.2
Arkansas	1,752,204	1,574,449	1,311,564	177,755	11.3	262,885	20.0
California	3,426,861	2,377,549	1,485,053	1,049,312	44.1	892,496	60.1
Colorado	939,629	799,024	539,700	140,605	17.6	259,324	48.0
Connecticut	1,380,631	1,114,756	908,420	265,875	23.9	206,336	22.7
Delaware	223,003	202,322	184,735	20,681	10.2	17,587	9.5
District of Columbia	437,571	331,069	278,718	106,502	32.2	52,351	18.8
Florida	968,470	752,619	528,542	215,851	28.7	224,077	42.4
Georgia	2,895,832	2,609,121	2,216,331	286,711	11.0	392,790	17.7
Idaho	431,866	325,594	161,772	106,272	32.6	163,822	101.3
Illinois	6,485,280	5,638,591	4,821,550	846,689	15.0	817,041	16.9
Indiana	2,930,390	2,700,876	2,516,462	229,514	8.5	184,414	7.3
Iowa	2,404,021	2,224,771	2,231,853	179,250	8.1	−7,082	−0.3
Kansas	1,769,257	1,690,949	1,470,495	78,308	4.6	220,454	15.0
Kentucky	2,416,630	2,289,905	2,147,174	126,725	5.5	142,731	6.6
Louisiana	1,798,509	1,656,388	1,381,625	142,121	8.6	274,763	19.9
Maine	768,014	742,371	694,466	25,643	3.5	47,905	6.9
Maryland	1,449,661	1,295,346	1,188,044	154,315	11.9	107,302	9.0
Massachusetts	3,852,356	3,366,416	2,805,346	485,940	14.4	561,070	20.0
Michigan	3,668,412	2,810,173	2,420,982	858,239	30.5	389,191	16.1
Minnesota	2,387,125	2,075,708	1,751,394	311,417	15.0	324,314	18.5
Mississippi	1,790,618	1,797,114	1,551,270	−6,496	−0.4	245,844	15.8
Missouri	3,404,055	3,293,335	3,106,665	110,720	3.4	186,670	6.0
Montana	548,889	376,053	243,329	172,836	46.0	132,724	54.5
Nebraska	1,296,372	1,192,214	1,066,300	104,158	8.7	125,914	11.8
Nevada	77,407	81,875	42,335	−4,468	−5.5	39,540	93.4
New Hampshire	443,083	430,572	411,588	12,511	2.9	18,984	4.6
New Jersey	3,155,900	2,537,167	1,883,669	618,733	24.4	653,498	34.7
New Mexico	360,350	327,301	195,310	33,049	10.1	131,991	67.6
New York	10,384,829	9,113,614	7,268,894	1,271,215	13.9	1,844,720	25.4
North Carolina	2,559,123	2,206,287	1,893,810	352,836	16.0	312,477	16.5
North Dakota	645,680	577,056	319,146	68,624	11.9	257,910	80.8
Ohio	5,759,394	4,767,121	4,157,545	992,273	20.8	609,576	14.7
Oklahoma	2,028,283	1,657,155	790,391	371,128	22.4	866,764	109.7
Oregon	783,389	672,765	413,536	110,624	16.4	259,229	62.7
Pennsylvania	8,720,017	7,665,111	6,302,115	1,054,906	13.8	1,362,996	21.6
Rhode Island	604,397	542,610	428,556	61,787	11.4	114,054	26.6
South Carolina	1,683,724	1,515,400	1,340,316	168,324	11.1	175,084	13.1
South Dakota	636,547	583,888	401,570	52,659	9.0	182,318	45.4
Tennessee	2,337,885	2,184,789	2,020,616	153,096	7.0	164,173	8.1
Texas	4,663,228	3,896,542	3,048,710	766,686	19.7	847,832	27.8
Utah	449,396	373,351	276,749	76,045	20.4	96,602	34.9
Vermont	352,428	355,956	343,641	−3,528	−1.0	12,315	3.6
Virginia	2,309,187	2,061,612	1,854,184	247,575	12.0	207,428	11.2
Washington	1,356,621	1,141,990	518,103	214,631	18.8	623,887	120.4
West Virginia	1,463,701	1,221,119	958,800	242,582	19.9	262,319	27.4
Wisconsin	2,632,067	2,333,860	2,069,042	298,207	12.8	264,818	12.8
Wyoming	194,402	145,965	92,531	48,437	33.2	53,434	57.7
Continental United States	105,708,771	91,972,266	75,994,575	13,736,505	14.9	15,977,691	21.0
Alaska	54,899	64,356	....	−9,457	....	....	....
American Samoa	8,056	7,251[2]	....	805	....	....	....
Guam	13,275	11,806	....	1,469	....	....	....
Hawaii	255,912	191,909	....	64,003	....	....	....
Panama Canal Zone	22,858	62,810[2]	....	−39,952	....	....	....
Porto Rico	1,299,809	1,118,012	....	181,797	....	....	....
Military and naval, etc., service abroad	117,238	55,608	....	61,630	....	....	....
Philippine Islands	10,350,640[3]	7,635,426[4]	....	2,715,214	....	....	....
Virgin Islands	26,051[5]	27,086[6]	....	−1,035	....	....	....
United States and Outlying Possessions	117,857,509	101,146,530	....	16,710,979	....	....	....

[1] Minus sign (−) denotes decrease. [2] 1912. [3] 1918. [4] 1903. [5] 1917. [6] 1911.

with the figures for 1910 the number of farms reported in 1920 showed an increase of 1.4 per cent., the total farm acreage an increase of 8.8 per cent. and the acreage of improved lands in farms an increase of 5.1 per cent. The value of all farm property showed an increase of 90.1 per cent. The number of manufacturing establishments in the United States increased 5.2 per cent. from 1914 to 1919, capital employed increased 95.1 per cent., salaries and wages increased 150.7 per cent., and value of products increased 157.4 per cent.

For statistics, see the article UNITED STATES; see also POPULATION, and other articles under separate titles; CENSUS, U. S. BUREAU OF. Consult *The History and Growth of the U. S. Census* (U. S. Bureau of Publications, 1900); *The Story of the Census*, 1790 to 1916 (U. S. Census Bureau, 1916).

Census, U. S. Bureau of, a bureau of the Department of Commerce, was created in 1902 as a branch of the Department of the Interior, was transferred to the Department of Commerce and Labor in 1903, and since 1913 has been a bureau of the Department of Commerce. Its primary function is the conduct of the comprehensive Federal decennial census of population, agriculture, manufacturing, and mines and quarries (see CENSUS), but it also conducts numerous other inquiries, notably decennial censuses of wealth, debt, and taxation, of religious bodies, of water transportation, of fisheries, and of dependent, defective, and delinquent classes; a quinquennial census of electrical industries; a biennial census of manufactures; annual compilation of statistics of births, deaths, marriages, and divorces, and of financial statistics of States and cities. It publishes quarterly data as to stocks of leaf tobacco held by manufacturers and dealers; issues periodical statistics of cotton production, consumption, and supply; collects current data (monthly or quarterly) relating to the production, supply, and sales of basic or key commodities, and publishes monthly a 'survey of current business.' In the year 1925 the Bureau will take for the first time a quinquennial census of agriculture. Heretofore this subject has been covered only once in ten years as a part of the decennial census of the United States.

The divisions of the Bureau and their functions are as follows: *Administrative Division:* General supervision of personnel; handling of general correspondence; distribution of publications; preparation of press summaries; and other work not belonging especially to any other single division. *Population Division:* Collection of statistics relating to population (including occupations), religious bodies, defective, dependent, and delinquent classes in institutions, and marriages and divorces. *Division of Manufactures:* Collection of statistics pertaining to manufactures and to electrical industries (including electric light and power plants, street and electric railways, telegraphs and telephones, and electric fire-alarm and police-patrol signalling systems), and to mines, quarries, and oil and gas wells, water transportation, and fisheries (in coöperation with the Bureau of Fisheries). *Division of Vital Statistics:* Collection of statistics of births and deaths in States and cities having adequate registration systems, and preparation of special reports presenting particular phases of vital statistics, such as *Life Tables* and *Mortality from Cancer*. *Division of Statistics of Cities:* Collection of financial and general statistics of cities having more than 30,000 inhabitants; of financial statistics of States; and statistics of national wealth, public indebtedness, and taxation. *Division of Agriculture:* Collection of statistics relating to agriculture. *Division of Cotton and Tobacco Statistics:* Collection of current statistics relating to cotton ginned, consumed, imported, exported, and on hand, and number of active cotton spindles, and quantities of leaf tobacco held by manufacturers. *Geographer's Division:* Maintenance of records as to boundaries of supervisors' and enumerators' districts and creation of new districts where needed; maintenance of records as to changes in boundaries of countries, precincts, and municipalities; decennial preparation of *Statistical Atlas of the United States;* preparation of maps, charts, and diagrams illustrating statistics in census publications; searching of old census records for information in regard to ages and other data concerning individuals; and preparation of population estimates between census years.

Cent, a contraction of the Latin *centum*, 'a hundred,' and of the Latin *centesimus*, 'a hundredth part.'

A *cent*, in the United States, is the hundredth part of a dollar. In 1785 Congress adopted a resolution that the money unit of the United States be one dollar, and the smallest coin a copper one, of which there should be 200 in each dollar. The following year it provided for the coinage of half cents and cents of copper. In 1792 an act was passed providing for the purchase of 150 tons of copper for the coinage of cents and half cents of 264 and 132 grams respectively; these were reduced in 1793 to 208 and 104 grams, and a further reduction was made in 1796. Thereafter the 'copper' or cent remained unchanged, except in pattern, until 1857, no cents being coined in 1815 or 1835. In 1851 a three-cent piece of 75 per cent. silver and 25 per cent. copper was authorized; in 1857 the half cent was abolished and a smaller cent replaced the old one, which was in turn replaced, in 1864, by a bronze cent, 95 per cent. copper and 5 per cent. tin and zinc; a bronze two-cent piece was also authorized. An act of 1866 provided for a 5-cent piece, three fourths copper and one fourth nickel; in 1873 all cent pieces but the one, three, and five were discarded and in 1890 the three-cent piece was discontinued.

Cent is also used for the following coins: *Centavo*, the hundredth part of the Chilean peso, also of the Mexican peso or dollar. *Centena*, the hundredth part of the Bolivian dollar. *Centesimo*, the hundredth part of the Italian lira. *Centime*, the hundredth part of the franc in France, Belgium, Switzerland, etc. *Centimo*, the hundredth part of the Spanish real, the old unit of value in Spain. In Holland it is the hundredth part of the Dutch guilder.

Centaurea, sen-tō-rē'*a* *or* sen-tō'ri-*a*, a genus of annual and perennial plants of the order Compositæ, found chiefly in Mediterranean countries and Australia, but also in the temperate regions of Europe and America. The central florets are generally tubular and five cleft, and form a convex head, the outer sterile florets being larger and irregular. Among cultivated species is the Cornflower (q. v.) or Blue-bottle (*C. cyanus*), familiar to European cornfields, and popularly known in the United States as Bachelors' Button. A large-flowered variety (*C. montana*) is cultivated in gardens. The annual or biennial Sweet Sultan (*C. moschata*), with purple, white, or yellow flower heads and pleasant scent, is also an old garden favorite. See illustration on page 624.

Cen'taurs ('bull-killers'), a wild race of men who in early times are said to have inhabited the forests and mountains of Thessaly, and whose chief occupation was bull-hunting. Earlier accounts represent them as huge savage men, but later legends picture them as monsters in which a human head and trunk were joined to the body and legs of a horse.

The Centaurs were said to be the offspring of Ixion and a cloud, and were celebrated in Greek mythology for their struggles with the Lapithæ (q. v.), and with Hercules. The most famous of their number was Chiron, the teacher of Achilles and other heroes. He was a wise and just man, but most of the Centaurs were cruel and lustful. Consult J. E. Harrison's *Prolegomena to Greek Religion;* J. C. Lawson's *Modern Greek Folklore and Ancient Greek Religion.*

Centaurus, a southern constellation mentioned by Aratus, and probably representative of the Centaur Chiron. It is situated between Argo and Scorpio, and is traversed by the Milky Way. The chief star, α Centauri, is a splendid binary, revolving in 79 years, at a mean distance twenty-four times that of the earth from the sun. The primary, which is fully twice as bright as Aldebaran, is stated by Sir David Gill to be a twin of our sun. It gives an identical spectrum, is of equal mass, and presumably of equal luminosity. Its companion is no less massive, but is much less bright. The pair are our nearest stellar neighbors, the intervening space being crossed by light in $4^1/_3$ years. Their measurement in 1833 yielded to Henderson the first authentic result for the parallax of a star.

The α Centauri system gained additional interest when, in 1917, it was discovered that a certain star of the eleventh magnitude was moving very nearly in the same direction and at the same speed as α Centauri. This evidence was sufficient to warrant the belief that this faint star belongs, gravitationally, to the α Centauri system, notwithstanding the great distance of over two degrees betweeen it and the two major components. This angular separation corresponds, at the distance of α Centauri, to a linear separation of about 10,000 times the distance from the earth to the sun. Definite proof of the relationship was furnished by the parallax measures which determined the distance of the faint star to be very slightly less than that of α Centauri. Being very near and at the same time of small apparent brightness, it must be very faint intrinsically. It is, in fact, but 1/10,000 as bright as the sun. No other star is known to be as faint. The star has been fittingly named 'Proxima Centauri.'

Alpha and β Centauri, a white star of the first magnitude, are designated the 'Southern Pointers,' because they guide the eye to the Cross; γ Centauri is binary, the period of revolution being about 200 years. Nova Centauri rose abruptly to seventh magnitude in July, 1895, and was noted by Mrs. Fleming on the Arequipa plates when the object itself was already far advanced toward extinction. In Centaurus, too, is to be found Sir John Herschel's 'blue planetary' (N.G.C. 3918), a nebula resembling Uranus magnified.

Photo from A. T. De La Mare Co., Inc.

A Cluster of Centaureas including Cornflowers and Sweet Sultan

Cen'taury (*Erythræa*), a genus of annual plants of the family Gentianaceæ. They are hardy little annuals native to Europe and Asia, and have showy pink or red flowers which are said to possess medicinal value. They are often planted in rockeries for ornamental purposes. The Common Centaury (*E. centaurium*) has been esteemed in medicine since the days of Dioscorides and Galen; and although no longer in the Pharmacopœia, its flower tops are still sometimes gathered and dried by country people in England and on the Continent. The allied *Sabbatia angularis*, known as Bitter Bloom or Rose Pink, enjoys similar repute in the United States and Canada.

Cen'tenary (Lat. *centum*), a period of a hundred years, usually employed to signify the commemoration of an event, as the birth (sometimes the death) of a great man.

Centennial Exhibition, International, an international exposition of the industrial and fine arts, in celebration of the one hundredth anniversary of American independence, held at Philadelphia from May 10 to Nov. 10, 1876. The Exhibition was authorized by Congress in March, 1871, and President Grant then appointed the Centennial Commission, headed by Joseph R. Hawley (q. v.). This commission, in turn, appointed Alfred T. Goshorn to be the director general. To finance the Exhibition, Congress, the State of Pennsylvania, and the city of Philadelphia each appropriated $1,500,000, while an additional sum of $2,300,000 was raised by private subscription. Fairmont Park was selected as the site; and here a space of 236 acres was set apart for the purpose, on which more than 200 buildings were erected.

The most important of these buildings were the Main Building, 1,880 by 464 feet, in which were housed the manufacturing,

Population of United States: Census of 1920 and 1910

ALABAMA	1920	1910
Alabama City	5,432	4,313
Albany	7,652	6,118
Alexander City	2,293	1,710
Andalusia	4,023	2,480
Anniston	17,734	12,794
Athens	3,323	1,715
Attalla	3,462	2,513
Auburn	2,143	1,408
Bessemer	18,674	10,864
Birmingham	178,806	132,685
Brewton	2,682	2,185
Bridgeport	2,018	2,125
Brighton	3,665	1,502
Carbon Hill	2,666	1,627
Cullman	2,467	2,130
Decatur	4,752	4,228
Demopolis	2,779	2,417
Dothan	10,034	7,016
Enterprise	3,013	2,322
Eufaula	4,939	4,259
Fairfield	5,003	.....
Florala	2,633	2,439
Florence	10,529	6,689
Fort Payne	2,025	1,317
Gadsden	14,737	10,557
Girard	4,942	4,214
Greenville	3,471	3,377
Hartsell	2,009	1,374
Huntsville	8,018	7,611
Jacksonville	2,395	2,231
Jasper	3,246	2,509
Lanett	4,976	3,820
Marion	2,035	1,834
Mignon	2,028	.....
Mobile	60,777	51,521
Montgomery	43,464	38,136
Opelika	4,960	4,734
Ozark	2,518	2,229
Phenix City	5,432	4,555
Piedmont	2,645	2,226
Prattville	2,316	2,222
Roanoke	3,841	2,034
Russellville	2,269	2,046
Selma	15,589	13,649
Sheffield	6,682	4,865
Sylacauga	2,141	1,456
Talladega	6,546	5,854
Tallassee	2,034	1,347
Troy	5,696	4,361
Tuscaloosa	11,996	8,407
Tuscumbia	3,855	3,324
Tuskegee	2,475	2,803
Union Springs	4,125	4,055
ALASKA		
Juneau	3,058	1,644
Ketchikan	2,458	1,613
ARIZONA		
Bisbee	9,205	9,019
Clifton	4,163	4,874
Douglas	9,916	6,437
Flagstaff	3,186	1,633
Glendale	2,737	.....
Globe	7,044	7,083
Jerome	4,030	2,393
Mesa	3,036	1,692
Miami	6,689	.....
Nogales	5,199	3,514
Phoenix	29,053	11,134
Prescott	5,010	5,092
Tucson	20,292	13,193
Winslow	3,730	2,381
Yuma	4,237	2,914
ARKANSAS		
Arkadelphia	3,311	2,745
Ashdown	2,052	1,247
Batesville	4,299	3,399
Benton	2,933	1,708
Bentonville	2,313	1,956
Blytheville	6,447	3,849
Booneville	2,199	1,631
Brinkley	2,714	1,740
Camden	3,238	3,995
Clarendon	2,638	2,037
Clarksville	2,127	1,456
Conway	4,564	2,794
Crossett	2,707	2,038
ARKANSAS (*Cont.*)	1920	1910
De Queen	2,517	2,018
Dermott	2,330	1,662
Earle	2,091	1,542
El Dorado	3,887	4,202
England	2,408	1,407
Eureka Springs	2,429	3,228
Fayetteville	5,362	4,471
Fordyce	2,996	2,794
Forrest City	3,377	2,484
Fort Smith	28,870	23,975
Harrison	3,477	1,602
Hartford	2,067	1,780
Helena	9,112	8,772
Hope	4,790	3,639
Hot Springs	11,695	14,434
Jonesboro	9,384	7,123
Little Rock	65,142	45,941
McGehee	2,368	1,157
Magnolia	2,158	2,045
Malvern	3,864	2,778
Marianna	5,074	4,810
Mena	3,441	3,953
Monticello	2,378	2,274
Morrillton	3,010	2,424
Nashville	2,144	2,374
Newport	3,771	3,557
North Little Rock	14,048	11,138
Paragould	6,306	5,248
Piggott	2,016	1,150
Pine Bluff	19,280	15,102
Prescott	2,691	2,705
Rogers	3,318	2,820
Russellville	4,505	2,936
Searcy	2,836	2,331
Siloam Springs	2,569	2,405
Springdale	2,263	1,755
Stamps	2,564	2,316
Stuttgart	4,522	2,740
Texarkana	8,257	5,655
Truman	2,598	.....
Van Buren	5,224	3,878
Walnut Ridge	2,226	1,798
Warren	2,145	2,057
West Helena	6,226	.....
Wynne	2,933	2,353
CALIFORNIA		
Alameda	28,806	23,383
Albany	2,462	808
Alhambra	9,096	5,021
Anaheim	5,526	2,628
Arcadia	2,239	696
Auburn	2,289	2,376
Azusa	2,460	1,477
Bakersfield	18,638	12,727
Benicia	2,693	2,360
Berkeley	56,036	40,434
Brawley	5,389	881
Burbank	2,913	.....
Burlingame	4,107	1,565
Calexico	6,223	797
Chico	9,339	3,750
Chino	2,132	1,444
Coalinga	2,934	4,199
Colton	4,282	3,980
Corona	4,129	3,540
Coronado	3,289	1,477
Daly City	3,779	.....
Dinuba	3,400	970
Dunsmuir	2,528	1,719
Eagle Rock	2,256	.....
East San Diego	4,148	.....
El Centro	5,464	1,610
Emeryville	2,390	2,613
Eureka	12,923	11,845
Fort Bragg	2,616	2,408
Fresno	45,086	24,892
Fullerton	4,415	1,725
Gilroy	2,862	2,437
Glendale	13,536	2,746
Glendora	2,028	.....
Grass Valley	4,006	4,520
Hanford	5,888	4,829
Hayward	3,487	2,746
Healdsburg	2,412	2,011
Hermosa Beach	2,327	679
Hollister	2,781	2,308
Huntington Park	4,513	1.299
Inglewood	3,286	1,536
CALIFORNIA (*Cont.*)	1920	1910
Lindsay	2,576	1,814
Lodi	4,850	2,697
Long Beach	55,593	17,809
Los Angeles	576,673	319,198
Los Gatos	2,317	2,232
Madera	3,444	2,404
Martinez	3,858	2,115
Marysville	5,461	5,430
Merced	3,974	3,102
Mill Valley	2,554	2,551
Modesto	9,241	4,034
Monrovia	5,480	3,576
Monterey	5,479	4,923
Monterey Park	4.108	.....
Napa	6,757	5,791
National City	3,116	1,733
Needles	2,807	....
Oakland	216,261	150,174
Ontario	7,280	4,274
Orange	4,884	2,920
Oroville	3,340	3,859
Oxnard	4,417	2,555
Pacific Grove	2,974	2,384
Palo Alto	5,900	4,486
Pasadena	45,354	30,291
Petaluma	6,226	5,880
Piedmont	4,282	1,719
Pittsburg	4,715	2,372
Pomona	13,505	10,207
Porterville	4,097	2,696
Red Bluff	3,104	3,530
Redding	2,962	3,572
Redlands	9,571	10,449
Redondo Beach	4,913	2,935
Redwood City	4,020	2,442
Reedley	2,447	.....
Richmond	16,843	6,802
Riverside	19,341	15,212
Roseville	4,477	2,608
Sacramento	65,908	44,696
Salinas	4,308	3,736
San Anselmo	2,475	1,531
San Bernardino	18,721	12,779
San Diego	74,683	39,578
San Fernando	3,204	.....
San Francisco	506,676	416,912
San Gabriel	2,640	.....
San Jose	39,642	28,946
San Leandro	5,703	3,471
San Luis Obispo	5,895	5,157
San Mateo	5,979	4,384
San Rafael	5,512	5,934
Sanger	2,578	.....
Santa Ana	15,485	8.429
Santa Barbara	19,441	11,659
Santa Clara	5,220	4,348
Santa Cruz	10,917	11,146
Santa Maria	3,943	2,260
Santa Monica	15,252	7,847
Santa Paula	3,967	2,216
Santa Rosa	8,758	7,817
Sausalito	2,790	2,383
Selma	3,158	1,750
Sierra Madre	2,026	1,303
South Pasadena	7,652	4,649
South San Francisco	4,411	1,989
Stockton	40,296	23,253
Taft	3,317	.....
Tracy	2,450	.....
Tulare	3,539	2,758
Turlock	3,394	1,573
Ukiah	2,305	2,136
Upland	2,912	2,384
Vallejo	21,107	11,340
Venice	10,385	3,119
Ventura	4,342	2,945
Visalia	5,753	4,550
Watsonville	5,013	4,446
Watts	4,529	1,922
Whittier	7,997	4,550
Willows	2,190	1,139
Woodland	4,147	3,187
COLORADO		
Alamosa	3,171	3,013
Boulder	11,006	9,539
Brighton	2,715	850
Brush	2,103	997
Canon City	4,551	5,162

Population of United States: Census of 1920 and 1910

COLORADO (*Cont.*)

	1920	1910
Colorado Springs	30,105	29,078
Cripple Creek	2,325	6,206
Delta	2,623	2,388
Denver	256,491	213,381
Durango	4,116	4,686
Englewood	4,356	2,983
Florence	2,629	2,712
Fort Collins	8,755	8,210
Fort Morgan	3,818	2,800
Glenwood Springs	2,073	2,019
Golden	2,484	2,477
Grand Junction	8,665	7,754
Greeley	10,958	8,179
La Junta	4,964	4,154
Lamar	2,512	2,977
Las Animas	2,252	2,008
Leadville	4,959	7,508
Longmont	5,848	4,256
Loveland	5,065	3,651
Monte Vista	2,484	2,544
Montrose	3,581	3,254
Pueblo	43,050	41,747
Rocky Ford	3,746	3,230
Salida	4,689	4,425
Sterling	6,415	3,044
Trinidad	10,906	10,204
Walsenburg	3,565	2,423

CONNECTICUT

	1920	1910
Ansonia	17,643	15,152
Branford	2,619	2,560
Bridgeport	143,555	102,054
Bristol	20,620	9,527
Danbury	18,943	20,234
Danielson	3,130	2,934
Derby	11,238	8,991
Greenwich	5,939	3,886
Groton	4,236	1,895
Hartford	138,036	98,915
Jewett City	3,196	3,023
Meriden	29,867	27,265
Middletown	13,638	11,851
Naugatuck	15,051	12,722
New Britain	59,316	43,916
New Haven	162,537	133,605
New London	25,688	19,659
Norwalk	27,743	15,922
Norwich	22,304	20,367
Putnam	7,711	6,637
Rockville	7,726	7,977
Shelton	9,475	4,807
Southington	5,085	3,714
Stafford Springs	3,383	3,059
Stamford	35,096	25,138
Stonington	2,100	2,083
Torrington	20,623	15,483
Wallingford	9,648	8,690
Waterbury	91,715	73,141
Willimantic	12,330	11,230
Winsted	8,248	7,754

DELAWARE

	1920	1910
Dover	4,042	3,720
Laurel	2,253	2,166
Lewes	2,074	2,158
Milford	2,703	2,603
New Castle	3,854	3,351
Newark	2,183	1,913
Seaford	2,141	2,108
Wilmington	110,168	87,411

DISTRICT OF COLUMBIA

	1920	1910
Washington	437,571	331,069

FLORIDA

	1920	1910
Apalachicola	3,066	3,065
Arcadia	3,479	1,736
Bartow	4,203	2,662
Bradentown	3,868	1,886
Clearwater	2,427	1,171
Daytona	5,445	3,082
De Funiak Springs	2,097	2,017
De Land	3,324	2,812
Fernandina	5,457	3,482
Fort Lauderdale	2,065	.....
Fort Meade	2,029	1,165
Fort Myers	3,678	2,463
Fort Pierce	2,115	1,333
Gainesville	6,860	6,183
Green Cove Springs	2,093	1,319
Jacksonville	91,558	57,699
Key West	18,749	19,945
Kissimmee	2,722	2,157
Lake City	3,341	5,032
Lakeland	7,062	3,719
Live Oak	3,103	3,450
Marianna	2,499	1,915
Miami	29,571	5,471
New Smyrna	2,007	1,121
Ocala	4,914	4,370
Orlando	9,282	3,894
Palatka	5,102	3,779
Palmetto	2,046	773
Pensacola	31,035	22,982
Plant City	3,729	2,481
Quincy	3,118	3,204
St. Augustine	6,192	5,494
St. Cloud	2,011	.....
St. Petersburg	14,237	4,127
Sanford	5,588	3,570
Sarasota	2,149	840
South Jacksonville	2,775	1,147
Tallahassee	5,637	5,018
Tampa	51,608	37,782
Tarpon Springs	2,105	2,212
Wauchula	2,081	1,099
West Palm Beach	8,659	1,743
West Tampa	8,463	8,258

GEORGIA

	1920	1910
Albany	11,555	8,190
Americus	9,010	8,063
Ashburn	2,116	2,214
Athens	16,748	14,913
Atlanta	200,616	154,839
Augusta	52,548	41,040
Bainbridge	4,792	4,217
Barnesville	3,059	3,068
Brunswick	14,413	10,182
Buford	2,500	1,683
Camilla	2,136	1,827
Canton	2,679	2,002
Carrollton	4,363	3,297
Cartersville	4,350	4,067
Cedartown	4,053	3,551
Cochran	2,021	1,638
College Park	3,622	2,173
Columbus	31,125	20,554
Commerce	2,459	2,238
Cordele	6,538	5,883
Covington	3,203	2,697
Cuthbert	3,022	3,210
Dalton	5,222	5,324
Dawson	3,504	3,827
Decatur	6,150	2,466
Douglas	3,401	3,550
Douglasville	2,159	1,462
Dublin	7,707	5,795
East Point	5,241	3,682
Eastman	2,707	2,355
Eatonton	2,519	2,036
Elberton	6,475	6,483
Fitzgerald	6,870	5,795
Forsyth	2,241	2,208
Fort Valley	3,223	2,697
Gainesville	6,272	5,925
Greensboro	2,128	2,120
Griffin	8,240	7,478
Hartwell	2,323	2,007
Hawkinsville	3,070	3,420
Jackson	2,027	1,862
Kirkwood	2,934	1,226
La Grange	17,038	5,587
Lafayette	2,104	1,590
Lawrenceville	2,059	1,518
McCaysville	2,166	1,253
Macon	52,995	40,665
Madison	2,348	2,412
Manchester	2,776	922
Marietta	6,190	5,949
Milledgeville	4,619	4,385
Millen	2,405	2,030
Monroe	3,211	3,029
Moultrie	6,789	3,349
Nashville	2,025	990
Newnan	7,037	5,548
Ocilla	2,180	2,017
Pelham	2,640	1,880
Porterdale	2,880	.....
Quitman	4,393	3,915
Rome	13,252	12,099
Sandersville	2,695	2,641
Savannah	83,252	65,064
Statesboro	3,807	2,529
Tallapoosa	2,719	2,117
Thomaston	2,502	1,645
Thomasville	8,196	6,727
Thomson	2,140	2,151
Tifton	3,005	2,381
Toccoa	3,567	3,120
Valdosta	10,783	7,656
Vidalia	2,860	1,776
Vienna	2,019	1,564
Washington	4,208	3,065
Waycross	18,068	14,485
Waynesboro	3,311	2,729
West Point	2,138	1,906
Winder	3,335	2,443

IDAHO

	1920	1910
Blackfoot	3,937	2,202
Boise	21,393	17,358
Buhl	2,245	639
Burley	5,408	....
Caldwell	5,106	3,543
Coeur d'Alene	6,447	7,291
Emmett	2,204	1,351
Idaho Falls	8,064	4,827
Kellogg	3,017	1,273
Lewiston	6,574	6,043
Malad	2,598	1,303
Montpelier	2,984	1,924
Moscow	3,956	3,670
Nampa	7,621	4,205
Payette	2,433	1,948
Pocatello	15,001	9,110
Preston	3,235	2,110
Rexburg	3,569	1,893
Rupert	2,372	297
St. Anthony	2,957	1,238
Sandpoint	2,876	2,993
Twin Falls	8,324	5,258
Wallace	2,816	3,000
Weiser	3,154	2,600

ILLINOIS

	1920	1910
Abingdon	2,721	2,464
Aledo	2,231	2,144
Alton	24,682	17,528
Anna	3,019	2,809
Arlington Heights	2,250	1,943
Auburn	2,660	1,814
Aurora	36,397	29,807
Averyville	3,815	2,668
Batavia	4,395	4,436
Beardstown	7,111	6,107
Belleville	24,823	21,122
Belvidere	7,804	7,253
Benld	3,316	1,912
Benton	7,201	2,675
Berwyn	14,150	5,841
Bloomington	28,725	25,768
Blue Island	11,424	8,043
Bradley	2,128	1,942
Breese	2,399	2,128
Bridgeport	2,229	2,703
Brookfield	3,589	2,186
Bushnell	2,716	2,619
Cairo	15,203	14,548
Canton	10,928	10,453
Carbondale	6,267	5,411
Carlinville	5,212	3,616
Carlyle	2,027	1,982
Carmi	2,667	2,833
Carrier Mills	2,343	1,558
Carrollton	2,020	2,323
Carterville	3,404	2,971
Carthage	2,129	2,373
Casey	2,189	2,157
Centralia	12,491	9,680
Champaign	15,873	12,421
Charleston	6,615	5,884
Chester	2,904	2,747
Chicago	2,701,705	2,185,283
Chicago Heights	19,653	14,525
Christopher	3,830	1,825
Cicero	44,995	14,557

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ILLINOIS (*Cont.*)	1920	1910
Clinton	5,898	5,165
Collinsville	9,753	7,478
Crystal Lake	2,249	1,931
Danville	33,776	27,871
De Kalb	7,871	8,102
Decatur	43,818	31,140
Depue	2,428	1,339
Des Plaines	3,451	2,348
Divernon	2,382	1,519
Dixon	8,191	7,216
Dolton	2,076	1,869
Downers Grove	3,543	2,601
Duquoin	7,285	5,454
Dwight	2,255	2,156
East Moline	8,675	2,665
East Peoria	2,214	1,493
East St. Louis	66,767	58,547
Edwardsville	5,336	5,014
Effingham	4,024	3,898
Eldorado	5,004	3,366
Elgin	27,454	25,976
Elmhurst	4,594	2,360
Evanston	37,234	24,978
Fairbury	2,532	2,505
Fairfield	2,754	2,479
Farmington	2,631	2,421
Flora	3,558	2,704
Forest Park	10,768	6,594
Frankfort Heights	3,423	....
Freeport	19,669	17,567
Fulton	2,445	2,174
Galena	4,742	4,835
Galesburg	23,834	22,089
Galva	2,974	2,498
Geneseo	3,375	3,199
Geneva	2,803	2,451
Georgetown	3,061	2,307
Gibson	2,234	2,086
Gillespie	4,063	2,241
Girard	2,387	1,891
Glen Ellyn	2,851	1,763
Glencoe	3,381	1,899
Granite City	14,757	9,903
Greenville	3,091	3,178
Harrisburg	7,125	5,309
Harvard	3,294	3,008
Harvey	9,216	7,227
Havana	3,614	3,525
Herrin	10,986	6,861
Highland	2,902	2,675
Highland Park	6,167	4,209
Hillsboro	5,074	3,424
Hinsdale	4,042	2,451
Hoopeston	5,451	4,698
Jacksonville	15,713	15,326
Jerseyville	3,839	4,113
Johnston City	7,137	3,248
Joliet	38,442	34,670
Kankakee	16,753	13,986
Kewanee	16,026	9,307
La Grange	6,525	5,282
La Salle	13,050	11,537
Ladd	2,040	1,910
Lake Forest	3,657	3,349
Lawrenceville	5,080	3,235
Lemont	2,322	2,284
Lewistown	2,279	2,312
Libertyville	2,125	1,724
Lincoln	11,882	10,892
Litchfield	6,215	5,971
Lockport	2,684	2,555
Lyons	2,564	1,483
Macomb	6,714	5,774
Madison	4,996	5,046
Marion	9,582	7,093
Marseilles	3,391	3,291
Marshall	2,222	2,569
Mascoutah	2,343	2,081
Mattoon	13,552	11,456
Maywood	12,072	8,033
Melrose Park	7,147	4,806
Mendote	3,934	3,806
Metropolis	5,055	4,655
Minonk	2,109	2,070
Moline	30,734	24,199
Momence	2,218	2,201
Monmouth	8,116	9,128
Monticello	2,280	1,981
Morris	4,505	4,563

ILLINOIS (*Cont.*)	1920	1910
Morrison	3,000	2,410
Mound City	2,756	2,837
Mounds	2,661	1,686
Mount Carmel	7,456	6,934
Mount Olive	3,503	3,501
Mount Vernon	9,815	8,007
Murphysboro	10,703	7,485
Naperville	3,830	3,449
Nashville	2,209	2,135
Newton	2,083	2,108
Nokomis	3,465	1,872
Normal	5,143	4,024
North Chicago	5,839	3,306
Oak Park	39,858	19,444
O'Fallon	2,379	2,018
Oglesby	4,135	3,194
Olney	4,491	5,011
Oregon	2,227	2,180
Ottawa	10,816	9,535
Pana	6,122	6,055
Paris	7,985	7,664
Park Ridge	3,383	2,009
Paxton	3,033	2,912
Pekin	12,086	9,897
Peoria	76,121	66,950
Peru	8,869	7,984
Petersburg	2,432	2,587
Pinckneyville	2,649	2,722
Pittsfield	2,129	2,095
Pontiac	6,664	6,090
Princeton	4,126	4,131
Quincy	35,978	36,587
River Forest	4,358	2,456
Riverside	2,532	1,702
Robinson	3,375	3,863
Rochelle	3,310	2,732
Rock Falls	2,927	2,657
Rock Island	35,177	24,335
Rockford	65,651	45,401
Roodhouse	2,928	2,171
Royalton	2,043	357
Rushville	2,275	2,422
St. Charles	4,099	4,046
Salem	3,457	2,669
Sandwich	2,409	2,557
Savanna	5,237	3,691
Sesser	2,841	1,292
Shelbyville	3,568	3,590
Silvis	2,541	1,163
Sparta	3,340	3,081
Spring Valley	6,493	7,035
Springfield	59,183	51,678
Staunton	6,027	5,048
Steger	2,304	2,161
Sterling	8,182	7,467
Streator	14,779	14,253
Sullivan	2,532	2,621
Summit	4,019	949
Sycamore	3,602	3,926
Taylorville	5,806	5,446
Toluca	2,503	2,407
Tuscola	2,564	2,453
Urbana	10,244	8,245
Vandalia	3,316	2,974
Venice	3,895	3,718
Villa Grove	2,493	1,828
Virden	4,682	4,000
Warsaw	2,031	2,254
Watseka	2,817	2,476
Waukegan	19,226	16,069
West Chicago	2,594	2,378
West Frankfort	8,478	2,111
West Hammond	7,492	4,948
Westville	4,241	2,607
Wheaton	4,137	3,423
White Hall	2,954	2,854
Wilmette	7,814	4,943
Winnetka	6,694	3,168
Witt	2,443	2,170
Wood River	3,476	84
Woodstock	5,523	4,331
Zeigler	2,338	....
Zion	5,580	4,789

INDIANA

	1920	1910
Alexandria	4,172	5,096
Anderson	29,767	22,476
Angola	2,650	2,610
Attica	3,392	3,335

INDIANA (*Cont.*)	1920	1910
Auburn	4,650	3,919
Aurora	4,299	4,410
Batesville	2,361	2,151
Bedford	9,076	8,716
Bicknell	7,635	2,794
Bloomington	11,595	8,838
Bluffton	5,391	4,987
Boonville	4,451	3,934
Brazil	9,293	9,340
Bremen	2,084	2,008
Brookville	2,220	2,169
Cannelton	2,008	2,130
Clarksville	2,322	2,743
Clinton	10,962	6,229
Columbia City	3,499	3,448
Columbus	8,990	8,813
Connersville	9,901	7,738
Crawfordsville	10,139	9,371
Crown Point	3,232	2,526
Decatur	4,762	4,471
Delphi	2,087	2,161
Dunkirk	2,532	3,031
East Chicago	35,967	19,098
Edinburg	2,376	2,040
Elkhart	24,277	19,282
Elwood	10,790	11,028
Evansville	85,264	69,647
Fairmount	2,155	2,506
Fort Wayne	86,549	63,933
Frankfort	11,585	8,634
Franklin	4,909	4,502
Garrett	4,796	4,149
Gary	55,378	16,802
Gas City	2,870	3,224
Goshen	9,525	8,514
Greencastle	3,780	3,790
Greenfield	4,168	4,448
Greensburg	5,345	5,420
Hammond	36,004	20,925
Hartford City	6,183	6,187
Hobart	3,450	1,753
Huntingburg	3,261	2,464
Huntington	14,000	10,272
Indianapolis	314,194	233,650
Jasonville	4,461	3,295
Jasper	2,539	2,196
Jeffersonville	10,098	10,412
Kendallville	5,273	4,981
Kokomo	30,067	17,010
La Porte	15,158	10,525
Lafayette	22,486	20,081
Lawrenceburg	3,466	3,930
Lebanon	6,257	5,474
Ligonier	2,037	2,173
Linton	5,856	5,906
Logansport	21,626	19,050
Loogootee	2,335	2,154
Madison	6,711	6,934
Marion	23,747	19,359
Martinsville	4,895	4,529
Michigan City	19,457	19,027
Mishawaka	15,195	11,886
Mitchell	3,025	3,438
Monticello	2,536	2,168
Montpelier	2,297	2,786
Mount Vernon	5,284	5,563
Muncie	36,524	24,005
Nappanee	2,678	2,260
New Albany	22,992	20,629
New Castle	14,458	9,446
Noblesville	4,758	5,073
North Manchester	2,711	2,428
North Vernon	3,084	2,915
Oakland City	2,270	2,370
Peru	12,410	10,910
Petersburg	2,367	2,170
Plymouth	4,338	3,838
Portland	5,958	5,130
Princeton	7,132	6,448
Rensselaer	2,912	2,393
Richmond	26,765	22,324
Rochester	3,720	3,364
Rockport	2,581	2,736
Rushville	5,498	4,925
Salem	2,836	2,283
Seymour	7,348	6,305
Shelbyville	9,701	9,500
South Bend	70,983	53,684
Spencer	2,066	2,150

Population of United States: Census of 1920 and 1910

INDIANA (*Cont.*)	1920	1910
Sullivan	4,489	4,115
Tell City	4,086	3,369
Terre Haute	66,083	58,157
Tipton	4,507	4,075
Union City	3,406	3,209
Valparaiso	6,518	6,987
Vincennes	17,160	14,895
Wabash	9,872	8,687
Warsaw	5,478	4,430
Washington	8,743	7,854
West Lafayette	3,830	3,867
West Terre Haute	4,310	3,083
Whiting	10,145	6,587
Winchester	4,021	4,266
IOWA		
Albia	5,067	4,969
Algona	3,724	2,908
Ames	6,270	4,223
Anamosa	2,881	2,983
Atlantic	5,329	4,560
Audubon	2,108	1,928
Bedford	2,073	1,883
Belle Plaine	3,887	3,121
Bettendorf	2,178	909
Bloomfield	2,064	2,028
Boone	12,451	10,347
Burlington	24,057	24,324
Carroll	4,254	3,546
Cedar Falls	6,316	5,012
Cedar Rapids	45,566	32,811
Centerville	8,486	6,936
Chariton	5,175	3,794
Charles City	7,350	5,892
Cherokee	5,824	4,884
Clarinda	4,511	3,832
Clarion	2,826	2,065
Clear Lake	2,804	2,014
Clinton	24,151	25,577
Colfax	2,504	2,524
Council Bluffs	36,162	29,292
Cresco	3,195	2,658
Creston	8,034	6,924
Davenport	56,727	43,028
Decorah	4,039	3,592
Denison	3,581	3,133
Des Moines	126,468	86,368
Dubuque	39,141	38,494
Eagle Grove	4,433	3,387
Eldon	2,091	2,024
Eldora	3,189	1,995
Emmetsburg	2,762	2,325
Estherville	4,699	3,404
Fairfield	5,948	4,970
Forest City	2,145	1,691
Fort Dodge	19,347	15,543
Fort Madison	12,066	8,900
Glenwood	3,862	4,052
Grinnell	5,362	5,036
Hamburg	2,017	1,817
Hampton	2,992	2,617
Harlan	2,831	2,570
Hawarden	2,491	2,107
Humboldt	2,232	1,809
Ida Grove	2,020	1,874
Independence	3,672	3,517
Indianola	3,628	3,283
Iowa City	11,267	10,091
Iowa Falls	3,954	2,797
Jefferson	3,416	2,477
Keokuk	14,423	14,008
Knoxville	3,523	3,190
Lake City	2,110	2,043
Le Mars	4,683	4,157
Leon	2,193	1,991
Manchester	3,111	2,758
Maquoketa	3,626	3,570
Marengo	2,048	1,786
Marion	4,138	4,400
Marshalltown	15,731	13,374
Mason City	20,065	11,230
Missouri Valley	3,985	3,187
Monticello	2,257	2,043
Mount Pleasant	3,987	3,874
Muscatine	16,068	16,178
Mystic	2,796	2,663
Nevada	2,668	2,138
New Hampton	2,539	2,275
Newton	6,627	4,616

IOWA (*Cont.*)	1920	1910
Oelwein	7,455	6,028
Onawa	2,256	2,026
Osage	2,878	2,445
Osceola	2,684	2,416
Oskaloosa	9,427	9,466
Ottumwa	23,003	22,012
Pella	3,338	3,021
Perry	5,642	4,630
Red Oak	5,578	4,830
Rock Rapids	2,172	2,005
Rockwell City	2,038	1,528
Sac City	2,630	2,201
Sheldon	3,488	2,941
Shenandoah	5,255	4,976
Sigourney	2,210	2,032
Sioux City	71,227	47,828
Spencer	4,599	3,005
Storm Lake	3,658	2,428
Tama	2,601	2,290
Tipton	2,142	2,048
Valley Junction	3,631	2,573
Villisca	2,111	2,039
Vinton	3,381	3,336
Washington	4,697	4,380
Waterloo	36,230	26,693
Waukon	2,359	2,025
Waverly	3,352	3,205
Webster City	5,657	5,208
Winterset	2,906	2,818
KANSAS		
Abilene	4,895	4,118
Anthony	2,740	2,669
Arkansas City	11,253	7,508
Arma	2,180	327
Atchison	12.630	16,429
Augusta	4,219	1,235
Baxter Springs	3,608	1,598
Belleville	2,254	2,224
Beloit	3,315	3,082
Burlington	2,236	2,180
Caldwell	2,191	2,205
Caney	3,427	3,597
Cahnute	10,286	9,272
Cherryvale	4,698	4,304
Clay Center	3,715	3,438
Coffeyville	13,452	12.687
Columbus	3,155	3.064
Concordia	4,705	4,415
Council Grove	2,857	2,545
Dodge City	5,061	3,214
El Dorado	10,995	3,129
Ellsworth	2,065	2,041
Emporia	11,273	9,058
Eureka	2,606	2,333
Fort Scott	10,693	10,463
Fredonia	3,954	3,040
Frontenac	3.225	3,396
Galena	4,712	6,096
Garden City	3,848	3.171
Garnett	2,329	2,334
Girard	3,161	2,446
Goodland	2,664	1,993
Great Bend	4,460	4,622
Hays	3,165	1,961
Herington	4,065	3,273
Hiawatha	3,222	2,974
Hoisington	2,395	1,975
Holton	2,703	2,842
Horton	4.009	3,600
Humboldt	2,525	2,548
Hutchinson	23,298	16,364
Independence	11,920	10,480
Iola	8,513	9,032
Junction City	7,533	5,598
Kansas City	101,177	82,331
Kingman	2,407	2,570
Larned	3,139	2,911
Lawrence	12,456	12,374
Leavenworth	16,912	19,363
Liberal	3,613	1,716
Lyons	2,516	2,071
McPherson	4,595	3,546
Manhattan	7,989	5,722
Marysville	3,048	2,260
Mulberry	2,697	997
Neodesha	3,943	2,872
Newton	9,781	7,862
Norton	2,186	1,787

KANSAS (*Cont.*)	1920	1910
Olathe	3,268	3,272
Osage	2,376	2,432
Osawatomie	4,772	4,046
Oswego	2,386	2,317
Ottawa	9,018	7,650
Paola	3,238	3,207
Parsons	16,028	12,463
Peabody	2,455	1,416
Pittsburg	18,052	14,755
Pratt	5,183	3,302
Rosedale	7,674	5,960
Sabetha	2,003	1,768
Salina	15,085	9,688
Sterling	2,060	2,133
Topeka	50,022	43,684
Wellington	7,048	7,034
Wichita	72,217	52,450
Winfield	7,933	6,700
Yates Center	2,306	2,024
KENTUCKY		
Ashland	14,729	8,688
Bellevue	7,379	6,683
Bowling Green	9,638	9,173
Carrollton	2,281	1,906
Catlettsburg	4,183	3,520
Central City	3,108	2,545
Clifton	2,065	....
Corbin	3,406	2,589
Covington	57,121	53,270
Cynthiana	3,857	3,603
Danville	5,099	5,420
Dayton	7,646	6,979
Earlington	3,652	3,931
Elizabethtown	2,530	1,970
Fleming	2,069	....
Fort Thomas	5,028	....
Frankfort	9,805	10,465
Franklin	3,154	3,063
Fulton	3,415	2,575
Georgetown	3,903	4,533
Glasgow	2,559	2,316
Harlan	2,647	657
Harrodsburg	3,765	3,147
Hazard	4,348	537
Henderson	12,169	11,452
Hickman	2,633	2,736
Highland Park	3,979	1,977
Hopkinsville	9,696	9,419
Irvine	2,705	272
Jenkins	4,707	....
Lancaster	2,166	1,507
Lebanon	3,239	3,077
Lexington	41,534	35,099
Louisa	2,011	1,356
Louisville	234,891	223,928
Ludlow	4,582	4,163
McRoberts	2,146	....
Madisonville	5,030	4,966
Mayfield	6,583	5,916
Maysville	6,107	6,141
Middlesborough	8,041	7,305
Morganfield	2,651	2,725
Mount Sterling	3,995	3,932
Murray	2,415	2,089
Newport	29,317	30,309
Nicholasville	2,786	2,935
Oakdale	3,198	2,073
Owensboro	17,424	16,011
Paducah	24,735	22,760
Paris	6,310	5,859
Pikeville	2,110	1,280
Pineville	2,908	2,161
Princeton	3,689	3,015
Providence	4,151	2,084
Richmond	5,622	5,340
Russellville	3,124	3,111
Scottsville	2,179	1,327
Shelbyville	3,760	3,412
Somerset	4,672	4,491
Van Lear	2,056	....
Versailles	2,061	2,268
Winchester	8,333	7,156
LOUISIANA		
Abbeville	3,461	2,907
Alexandria	17,510	11,213
Baton Rouge	21,782	14,897
Bogalusa	8,245	....

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LOUISIANA (*Cont.*)

	1920	1910
Covington	2,942	2,601
Crowley	6,108	5,099
De Ridder	3,535	2,100
Donaldsonville	3,745	4,090
Eunice	3,272	1,684
Franklin	3,504	3,857
Fullerton	2,412	1,238
Glenmora	2,298	....
Gretna	7,197	....
Hammond	3,855	2,942
Homer	3,305	1,855
Houma	5,160	5,024
Jackson	2,320	2,146
Jeanerette	2,512	2,206
Jennings	3,824	3,925
Kentwood	3,059	3,609
Lafayette	7,855	6,392
Lake Charles	13,088	11,449
Leesville	2,518	2,043
Mansfield	2,564	1,799
Merryville	2,963	....
Minden	6,105	3,002
Monroe	12,675	10,209
Morgan	5,429	5,477
Natchitoches	3,388	2,532
New Iberia	6,278	7,499
New Orleans	387,219	339,075
Oakdale	4,016	....
Opelousa	4,437	4,623
Patterson	2,538	2,998
Pineville	2,188	1,212
Plaquemine	4,632	4,955
Rayne	2,720	2,247
Ruston	3,389	3,377
St. Martinsville	2,465	2,318
Shreveport	43,874	28,015
Slidell	2,958	2,188
Thibodaux	3,526	3,824
West Monroe	2,240	1,127
Winnfield	2,975	2,925

MAINE

	1920	1910
Auburn	16,985	15,064
Augusta	14,114	13,211
Bangor	25,978	24,803
Bath	14,731	9,396
Belfast	5,083	4,618
Biddeford	18,008	17,079
Brewer	6,064	5,667
Brunswick	5,784	5,341
Calais	6,084	6,116
Eastport	4,494	4,961
Ellsworth	3,058	3,549
Fairfield	2,747	2,801
Gardiner	5,475	5,311
Hallowell	2,764	2.864
Lewiston	31,791	26,247
Madison	2,729	2,408
Norway	2,208	2,215
Old Town	6,956	6,317
Pittsfield	2,146	2,231
Portland	69,272	58,571
Presque Isle	3,452	2,938
Rockland	8,109	8,174
Rumford Falls	7,016	5,427
Saco	6,817	6,583
South Portland	9,254	7,471
Waterville	13,351	11,458
Westbrook	9,453	8,281

MARYLAND

	1920	1910
Annapolis	11,214	8,609
Baltimore	733,826	558,485
Brunswick	3,905	3,721
Cambridge	7,467	6,407
Chestertown	2,537	2,735
Crisfield	4,116	3,468
Cumberland	29,837	21,839
Easton	3,442	3,083
Elkton	2,660	2,487
Frederick	11,066	10.411
Frostburg	6,017	6,028
Hagerstown	28,064	16,507
Havre de Grace	4.377	4,212
Hyattsville	2,675	1,917
Laurel	2,239	2,415
Lonaconing	2,054	1,553

MARYLAND (*Cont.*)

	1920	1910
Mount Rainier	2,462	1,242
Pocomoke City	2,444	2,369
Salisbury	7,553	6,690
Takoma Park	3,168	1.242
Westernport	3,977	2,702
Westminster	3,521	3,295

MASSACHUSETTS

	1920	1910
Abington	5,787	5,455
Acushnet	3,075	1,692
Adams	12,967	13,026
Agawam	5,023	3,501
Amesbury	10,036	9,894
Amherst	5,550	5,112
Andover	8,268	7,301
Arlington	18,665	11,187
Athol	9,792	8,536
Attleboro	19,731	16,215
Auburn	3,891	2,420
Ayer	3,052	2,797
Barnstable	4,836	4,676
Barre	3,357	2,957
Belmont	10,749	5,542
Beverly	22,561	18,650
Billerica	3,646	2,789
Blackstone	4,299	5,648
Boston	748,060	670,585
Bourne	2,530	2,474
Braintree	10,580	8,066
Bridgewater	8,438	7,688
Brockton	66,254	56,878
Brookline	37,748	27,792
Cambridge	109,694	104,839
Canton	5,945	4,797
Chelmsford	5,682	5,010
Chelsea	43,184	32,452
Chicopee	36,214	25,401
Clinton	12,979	13,075
Cohasset	2,639	2,585
Concord	6,461	6,421
Dalton	3,752	3,568
Danvers	11,108	9,407
Dartmouth	6,493	4,378
Dedham	10,792	9,284
Deerfield	2,803	2,209
Dighton	2,574	2,235
Dracut	5,280	3,461
Dudley	3,701	4,267
East Bridgewater	3,486	3,363
Easthampton	11,261	8,524
Easton	5,041	5,139
Everett	40,120	33,484
Fairhaven	7,291	5,122
Fall River	120,485	119,295
Falmouth	3,500	3,144
Fitchburg	41,029	37,826
Foxborough	4,136	3,863
Framingham	17,033	12,948
Franklin	6,497	5,641
Gardner	16,971	14,699
Gloucester	22,947	24,398
Grafton	6,887	5,705
Great Barrington	6,315	5,926
Greenfield	15,462	10,427
Groveland	2,650	2,253
Hadley	2,784	1,999
Hanover	2,575	2,326
Hardwick	3,085	3,524
Harvard	2,546	1,034
Hatfield	2,651	1,986
Haverhill	53,884	44,115
Hingham	5,604	4,965
Holbrook	3,161	2,816
Holden	2,970	2,147
Holliston	2,707	2,711
Hopedale	2,777	2,188
Holyoke	60,203	57,730
Hudson	7,607	6,743
Ipswich	6,201	5,777
Kingston	2,505	2,445
Lawrence	94,270	85,892
Lee	4,085	4,106
Leicester	3,635	3,237
Lenox	2,691	3,060
Leominster	19,744	17,580
Lexington	6,350	4,918
Longmeadow	2,618	1,084
Lowell	112,759	106,294

MASSACHUSETTS (*Cont.*)

	1920	1910
Ludlow	7,470	4,948
Lynn	99,148	89,336
Malden	49,103	44,404
Mansfield	6,255	5,183
Marblehead	7,324	7,338
Marlborough	15,028	14,579
Maynard	7,086	6,390
Medfield	3,595	3,466
Medford	39,038	23,150
Medway	2,956	2.696
Melrose	18,204	15,715
Methuen	15,189	11,448
Middleborough	8,453	8,214
Milford	13,471	13,055
Millbury	5,653	4,740
Milton	9,382	7,924
Monson	4,826	4,758
Montague	7,675	6,866
Nantucket	2,797	2,962
Natick	10,907	9,866
Needham	7,012	5,026
New Bedford	121,217	96 652
Newburyport	15,618	14,949
Newton	46,054	39,806
North Adams	22,282	22,019
Northampton	21,951	19,431
North Andover	6,265	5,529
North Attleborough	9,238	9,562
North Brookfield	2,610	3,075
Northbridge	10,174	8,807
Norwood	12,627	8,014
Orange	5,393	5,282
Oxford	3,820	3,361
Palmer	9,896	8,610
Peabody	19,552	15,721
Pittsfield	41,763	32,121
Plymouth	13,045	12,141
Provincetown	4,246	4,369
Quincy	47,876	32,642
Randolph	4,756	4,301
Reading	7,439	5,818
Revere	28,823	18,219
Rockland	7,544	6,928
Rockport	3,878	4,211
Salem	42,529	43,697
Saugus	10,874	8,047
Scituate	2,534	2,482
Seekonk	2,898	2,397
Shrewsbury	3,708	1,946
Somerset	3,520	2,798
Somerville	93,091	77,236
South Hadley	5,527	4,894
Southbridge	14,245	12,592
Spencer	5,930	6,740
Springfield	129,614	88,926
Stoneham	7,873	7,090
Stoughton	6,865	6,316
Sutton	2,578	3,078
Swampscott	8,101	6,204
Taunton	37,137	34,259
Templeton	4,019	3.756
Tewsbury	4,450	3,750
Uxbridge	5,384	4,671
Wakefield	13,025	11,404
Walpole	5,446	4,892
Waltham	30,915	27,834
Ware	8,525	8,774
Wareham	4,415	4,102
Warren	3,467	4,188
Watertown	21,457	12,875
Webster	13,258	11,509
Wellesley	6,224	5,413
West Bridgewater	2,908	2,231
West Springfield	13,443	9,224
Westborough	5,789	5,446
Westfield	18,604	16,044
Westford	3,170	2,851
Westport	3,115	2,928
Weymouth	15,057	12,895
Whitman	7,147	7,292
Wilbraham	2,780	2,332
Williamstown	3,707	3.708
Wilmington	2,581	1,858
Winchendon	5,904	5,678
Winchester	10,485	9,309
Winthrop	15,455	10,132
Wretham	2,808	1,743
Woburn	16,574	15,308
Worcester	179,754	145 986

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MICHIGAN

	1920	1910
Adrian	11,878	10,763
Albion	8,354	5,833
Allegan	3,637	3,419
Alma	7,542	2,757
Alpena	11,101	12,706
Ann Arbor	19,516	14,817
Bad Axe	2,140	1,559
Battle Creek	36,164	25,267
Bay City	47,554	45,166
Belding	3,911	4,119
Benton Harbor	12,233	9,185
Bessemer	5,482	4,583
Big Rapids	4,558	4,519
Birmingham	3,694	1,607
Boyne City	4,284	5,218
Buchanan	3,187	1,831
Cadillac	9,750	8,375
Caro	2,704	2,272
Charlevoix	2,218	2,420
Charlotte	5,126	4,886
Cheboygan	5,642	6,859
Chelsea	2,079	1,764
Coldwater	6,114	5,945
Crystal Falls	3,394	3,775
Dearborn	2,470	911
Detroit	993,678	465,766
Dowagiac	5,440	5,088
Durand	2,672	2,315
East Jordan	2,428	2,516
Eaton Rapids	2,379	2,094
Ecorse	4,394	1,063
Escanaba	13,103	13,194
Fenton	2,507	2,331
Ferndale	2,640	....
Flint	91 599	38,550
Ford	4,294	1,689
Fremont	2,180	2.009
Gladstone	4,953	4,211
Grand Haven	7,205	5,856
Grand Ledge	3,043	2.893
Grand Rapids	137,634	112,571
Grayling	2,450	1,775
Greenville	4,304	4,045
Grosse Pointe	2,084	830
Hamtramck	48,615	3.559
Hancock	7,527	8,819
Hastings	5,132	4,383
Highland Park	46,499	4,120
Hillsdale	5,476	5.001
Holland	12,183	10,490
Houghton	4,466	5,113
Howell	2,951	2,338
Hudson	2,464	2.178
Ionia	6,935	5,030
Iron Mountain	8,251	9,216
Iron River	4,295	2,450
Ironwood	15,739	12,821
Ishpeming	10,500	12,448
Jackson	48,374	31,433
Kalamazoo	48,487	39,437
Lake Linden	2.182	2,325
Lansing	57,327	31,229
Lapeer	4,723	3,946
Laurium	6,696	8,537
Ludington	8,810	9,132
Manistee	9,694	12,381
Manistique	6,380	4,722
Marine City	3,731	3,770
Marquette	12,718	11,503
Marshall	4,270	4,236
Menominee	8,907	10,507
Midland	5,483	2.527
Monroe	11,573	6.893
Mount Clemens	9,488	7,707
Mount Pleasant	4,819	3,972
Munising	5,037	2,952
Muskegon	36,570	24,062
Muskegon Heights	9,514	1,690
Negaunee	7,419	8,460
Newberry	2,172	1,182
Niles	7,311	5,156
Norway	4,533	4,974
Onaway	2,789	2,702
Otsego	3,168	2,812
Owosso	12,575	9,639
Petoskey	5,064	4,778
Plainville	2,049	1,493
Plymouth	2,857	1,671
Pontiac	34,273	14,532
Port Huron	25,944	18,863
Red Jacket	2,390	4,211
River Rouge	9,822	4,163
Rochester	2,549	1,516
Rogers	2,109	705
Romeo	2,102	1,787
Royal Oak	6,007	1,071
Saginaw	61,903	50,510
St. Clair	3,204	2,633
St. Johns	3,925	3,154
St. Joseph	7,251	5,936
St. Louis	3,036	1,940
Sault Ste. Marie	12,096	12,615
South Haven	3,829	3,577
Stambaugh	2,263	1,322
Sturgis	5,995	3,635
Tecumseh	2,432	2,332
Three Rivers	5,209	5,072
Traverse City	10,925	12,115
Wakefield	4,151	714
Wyandotte	13,851	8,287
Ypsilanti	7,413	6,230
Zeeland	2,275	1,982

MINNESOTA[1]

	1920	1910
Albert Lea	8,056	6,192
Alexandria	3,388	3,001
Anoka	4,287	3,972
Aurora	2,809	1,919
Austin	10,118	6,960
Bemidjii	7,086	5,099
Benson	2,111	1,677
Biwabik	2,024	1,690
Blue Earth	2,568	2,319
Brainerd	9,591	8,526
Breckenridge	2,401	1,840
Buhl	2,007	1,005
Cass Lake	2,109	2,011
Chisholm	9,039	7,684
Cloquet	5,127	7,031
Columbia Heights	2,968	590
Crookston	6.825	7,559
Crosby	3,500	....
Detroit	3,426	2.807
Duluth	98,917	78,466
East Grand Forks	2,490	2.533
Ely	4,902	3,572
Eveleth	7,205	7.036
Fairmont	4,630	2,958
Faribault	11,089	9.001
Fergus Falls	7,581	6,887
Gilbert	3,510	1,710
Glenwood	2,187	2.161
Grand Rapids	2,914	2,230
Hastings	4,571	3,983
Hibbing	15,089	8,832
Hutchinson	3.379	2,368
International Falls	3,448	1,487
Jackson	2,144	1,907
Lake City	2,846	3,142
Litchfield	2,790	2,333
Little Falls	5.500	6,078
Luverne	2,782	2,540
Mankato	12,469	10.365
Marshall	3,092	2.152
Melrose	2,529	2,591
Minneapolis	380,582	301.408
Montevideo	4,419	3,056
Moorhead	5.720	4,840
Morris	2 320	1,685
Nashwank	2.414	2,080
New Ulm	6,745	5,648
Northfield	4,023	3,265
Owatonna	7,252	5,658
Pipestone	5,325	2,475
Proctorknott	2,378	2.243
Red Wing	8,637	9,048
Redwood Falls	2,421	1,666
Richfield	2.411	2,673
Rochester	13,722	7,844
St. Cloud	15,873	10,600
St. James	2,673	2.102
St. Louis Park	2,281	1,743
St. Paul	234,698	214,744
St. Peter	4,335	4,176
Sauk Center	2,699	2,154
Sauk Rapids	2,349	1,745
Sleepy Eye	2,449	2.247
South St. Paul	6,860	4,510
Staples	2,570	2,558
Stillwater	7,735	10,198
Thief River Falls	4,685	3,714
Tracy	2,463	1,876
Two Harbors	4,546	4,990
Virginia	14,022	10,473
Wabasha	2,249	2,622
Wadena	2,186	1,820
Waseca	3,908	3,054
West Minneapolis	3,055	3,022
West St. Paul	2,962	2,660
White Bear Lake	2,022	1,505
Willmar	5,892	4,135
Windom	2,123	1,749
Winona	19,143	18,583
Worthington	3,481	2,385

MISSISSIPPI

	1920	1910
Aberdeen	4,071	3,708
Amory	2,861	2,122
Bay St. Louis	3,033	3,388
Belzoni	2,277	1,059
Biloxi	10,937	8,049
Brookhaven	4,706	5,293
Canton	3,252	3,929
Charleston	3,007	1,834
Clarksdale	7,552	4,079
Columbia	2,826	2,029
Columbus	10,501	8,988
Corinth	5,498	5,020
Greenville	11,560	9.610
Greenwood	7,793	5,836
Grenada	3,402	2,814
Gulfport	8,157	6,386
Hattiesburg	13,270	11,733
Holly Springs	2,113	2,192
Indianola	2,112	1,098
Jackson	22,817	21,262
Kosciusko	2,258	2,385
Laurel	13,037	8,465
Leland	2,003	1,547
Lumberton	2,192	2,122
McComb	7,775	6.237
Macon	2,051	2,024
Magnolia	2,012	1,823
Meridian	23,399	23,285
Moss Point	3,340	3,054
Natchez	12,608	11,791
New Albany	2,531	2,032
Okolona	3,852	2.584
Oxford	2,150	2.014
Pascagoula	6,082	3.379
Pass Christian	2,357	2,458
Picayune	2,479	846
Starkville	2,596	2,698
Tupelo	5,055	3,881
Vicksburg	18,072	20,814
Water Valley	4,315	4,275
West Point	4,400	4,864
Winona	2,572	2,512
Yazoo City	5,244	6,796

MISSOURI

	1920	1910
Albany	2,016	1.922
Aurora	3,575	4,148
Bethany	2,080	1,931
Bonne Terre	3,815	....
Boonville	4,665	4,252
Brookfield	6,304	5,749
Butler	2,702	2,894
California	2,218	2,154
Cameron	3,248	2.980
Campbell	2,025	1,781
Cape Girardeau	10,252	8,475
Carrollton	3,218	3,452
Carterville	2,434	4,539
Carthage	10,068	9,483
Caruthersville	4,750	3,655
Centralia	2,071	2,116
Chaffee	3,035	2,082
Charleston	3,410	3,144
Chillicothe	6,772	6,265
Clayton	3,028	....
Clinton	5,098	4,992
Columbia	10,392	9,662
Crystal City	2,243	....
De Soto	5,003	4,721
Dexter	2,635	2,322
Eldon	2,636	1,999

Population of United States: Census of 1920 and 1910

MISSOURI (*Cont.*)	1920	1910
Eldorado Springs	2,212	2,503
Elvins	2,418	2,071
Excelsior Springs	4,165	3,900
Farmington	2,685	2,613
Fayette	2,381	2,586
Festus	3,348	2,556
Fredericktown	3,124	2,632
Fulton	5,595	5,228
Hannibal	19,306	18,341
Harrisonville	2,073	1,947
Higginsville	2,724	2,628
Holden	2,011	2,007
Huntsville	2,126	2,247
Independence	11,686	9,859
Jackson	2,114	2,105
Jefferson City	14,490	11,850
Joplin	29,902	32,073
Kansas City	324,410	248,381
Kennett	3,622	3,033
Kirksville	7,213	6,347
Kirkwood	4,422	4,171
Lamar	2,255	2,316
Lebanon	2,848	2,430
Lexington	4,695	5,242
Liberty	3,097	2,980
Louisiana	4,060	4,454
Macon	3,549	3,584
Malden	2,098	2,116
Maplewood	7,431	4,976
Marceline	3,760	3,920
Marshall	5,200	4,869
Maryville	4,711	4,762
Mexico	6,013	5,939
Milan	2,395	2,191
Moberly	12,808	10,923
Monett	4,206	4,177
Mountain Grove	2,212	1,722
Mosho	3,968	3,661
Nevada	7,139	7,176
Poplar Bluff	8,042	6,916
Rich Hill	2,261	2,755
Richmond	4,409	3,664
Richmond Heights	2,136	....
Rolla	2,077	2,261
St. Charles	8,503	9,437
St. Joseph	77,939	77,403
St. Louis	772,897	687.029
Ste. Genevieve	2,046	1,967
Sedalia	21,144	17,822
Sikeston	3,613	3,327
Slater	3,797	3,238
Springfield	39,631	35,201
Trenton	6.951	5,656
University	6,792	2,417
Vandalia	2,158	1,595
Warrensburg	4,811	4,689
Washington	3,132	3,670
Webb City	7,807	11,817
Webster Groves	9,474	7,080
West Plains	3,178	2.914
Windsor	2,034	2,241

MONTANA		
Anaconda	11,668	10,134
Billings	15,100	10,031
Bozeman	6,183	5,107
Butte	41,611	39,165
Deer Lodge	3,780	2,570
Dillon	2,701	1,835
Glasgow	2,059	1,158
Glendive	3,816	2,428
Great Falls	24,121	13,948
Havre	5,429	3.624
Helena	12,037	12,515
Kalispell	5,147	5,549
Laurel	2,239	806
Lewistown	6.120	2,992
Livingston	6,311	5,359
Miles City	7,937	4,697
Missoula	12,668	12.869
Red Lodge	4,515	4,860
Roundup	2,434	1,513
Walkerville	2.391	2,491
Whitefish	2,867	1,479
Wolf Point	2,098	....

NEBRASKA	1920	1910
Alliance	4,591	3,105
Auburn	2,863	2,729
Aurora	2.962	2,630

NEBRASKA (*Cont.*)	1920	1910
Bayard	2,127	261
Beatrice	9,664	9,356
Blair	2,702	2,584
Broken Bow	2,567	2,260
Central City	2,410	2,428
Chadron	4,412	2,687
College View	2,249	1,508
Columbus	5,410	5,014
Crete	2,445	2,404
David City	2,216	2,177
Fairbury	5.454	5,294
Falls City	4,930	3,255
Fremont	9,605	8,718
Gering	2,508	627
Grand Island	13,947	10,326
Hastings	11,647	9,338
Havelock	3,602	2,680
Holdrege	3,108	3,030
Kearney	7,702	6,202
Lexington	2,327	2,059
Lincoln	54,948	43,973
McCook	4,303	3,765
Nebraska City	6,279	5,488
Norfolk	8,634	6,025
North Platte	10,466	4,793
O'Neil	2,107	2,089
Omaha	191,601	124,096
Ord	2,143	1,960
Plattsmouth	4,190	4,287
Schuyler	2,636	2,152
Scottsbluff	6,912	1,746
Seward	2,368	2,106
Sidney	2,852	1,185
South Sioux	2,402	1,196
Superior	2,719	2,106
University	4,112	3,200
Wahoo	2,338	2,168
Wayne	2,115	2.140
West Point	2,002	1,776
Wymore	2,592	2,613
York	5.388	6,235

NEVADA		
Elko	2,173	....
Ely	2,090	2,055
Las Vagas	2,304	....
Reno	12,016	10,867
Sparks	3,238	2,500
Tonopah	4,144	3,900

NEW HAMPSHIRE		
Berlin	16,104	11,780
Claremont	9,524	7,529
Concord	22,167	21,497
Conway	3,102	3,413
Derry	5,382	5.123
Dover	13,029	13,247
Exeter	4,604	4,897
Franklin	6,318	6,132
Gorham	2,734	2,155
Haverhill	3,406	3,498
Keene	11,210	10,068
Laconia	10,897	10,183
Lancaster	2,819	3,054
Lebanon	6,162	5,718
Littleton	4,239	4,069
Manchester	78,384	70,063
Milford	3,783	3,939
Nashua	28,379	26,005
Newmarket	3,181	3,348
Newport	4,109	3,765
Northumberland	2,567	2,184
Pembroke	2,563	3,062
Peterboro	2,615	2,277
Portsmouth	13,569	11,269
Rochester	9,673	8,868
Somersworth	6,688	6,704
Walpole	2,553	2,668

NEW JERSEY		
Alpha	2,140	....
Asbury Park	12,400	10,150
Atlantic City	50,707	46,150
Audubon	4,740	1,343
Bayonne	76,754	55,545
Belleville	15,660	....
Bergenfield	3,667	1,991
Beverly	2,562	2,140
Bloomfield	22,019	15,070

NEW JERSEY (*Cont.*)	1920	1910
Bloomingdale	2,193	....
Bogota	3,906	1,125
Boonton	5,372	4,930
Bordentown	4,371	4,250
Bound Brook	5,906	3,970
Bradley Beach	2,307	1,807
Bridgeton	14.323	14,209
Burlington	9,049	8,336
Butler	2,886	2,265
Caldwell	3,993	2,236
Camden	116,309	94,538
Cape May	2,999	2,471
Carlstadt	4,472	3,807
Chatham	2,421	1,874
Cliffside Park	5,709	3,394
Clifton	26,470	....
Collingswood	8,714	4,795
Dover	9,803	7.468
Dumont	2,537	1,783
Dunellen	3,394	1,990
East Newark	3,057	3,163
East Orange	50,710	34,371
East Paterson	2,441	....
East Rutherford	5.463	4,275
Edgewater	3,530	2,655
Egg Harbor	2,622	2,181
Elizabeth	95,783	73,409
Englewood	11,627	9,924
Fairview	4,882	2,441
Flemington	2,590	2,693
Fort Lee	5,761	4,472
Franklin	4,075	....
Freehold	4,768	3,233
Garfield	19,381	10,213
Garwood	2,084	1,118
Glen Ridge	4,620	3.260
Glen Rock	2,181	1.055
Gloucester	12,162	9,462
Guttenberg	6,726	5,647
Hackensack	17,667	14,050
Hackettstown	2,936	2,715
Haddon Heights	2,950	1,452
Haddonfield	5,646	4,142
Haledon	3,435	2,560
Hammonton	6,417	5,088
Harrison	15,721	14,498
Hasbrouck Heights	2,895	2.155
Hawthorne	5,135	3,400
Highland Park	4,866	1,517
Hightstown	2,674	1,879
Hoboken	68,166	70,324
Irvington	25,480	11,877
Jamesburg	2,052	1,560
Jersey City	298,103	267,779
Kearney	26,724	18,659
Keyport	4,415	3,554
Lambertville	4,660	4,657
Leonia	2,979	1,486
Little Ferry	2,715	2,541
Lodi	8,175	4,138
Long Branch	13,521	13,298
Madison	5,523	4,658
Merchantville	2,749	1,996
Metuchen	3,334	2,138
Midland Park	2,243	2,001
Milltown	2,573	1,584
Millville	14,691	12,451
Montclair	28,810	21,550
Morristown	12,548	12,507
New Brunswick	32,779	23,388
Newark	414,524	347,469
Newton	4,125	4,467
North Plainfield	6,916	6,117
Nutley	9,421	6,009
Ocean City	2,512	1,950
Orange	33,268	29,630
Palisades Park	2,633	1,411
Passaic	63,841	54,773
Paterson	135,875	125,600
Paulsboro	4,352	2,121
Pennsgrove	6,060	2,118
Perth Amboy	41,707	32,121
Phillipsburg	16,923	13,903
Pitman	3,385	1,950
Plainfield	27,700	20,550
Pleasantville	5,887	4,390
Pompton Lakes	2,008	1,060
Princeton	5,917	5,136
Prospect Park	4.292	2,719

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NEW JERSEY (*Cont.*)

	1920	1910
Rahway	11,042	9,337
Ramsey	2,090	1,667
Raritan	4,457	3,672
Red Bank	9,251	7,398
Ridgefield Park	8,575	....
Ridgewood	7,580	5,416
Riverton	2,341	1,788
Rockaway	2,655	1,902
Roosevelt	11,047	5,786
Roselle	5,737	2,725
Roselle Park	5,438	3,138
Rutherford	9,497	7,045
Salem	7,435	6,614
Secaucus	5,423	4,740
Somerville	6,718	5,060
South Amboy	7,897	7,007
South Orange	7,274	6,014
South River	6,596	4,772
Summit	10,174	7,500
Tenafly	3,585	2,756
Trenton	119,289	96,815
Union	20,651	21,023
Ventnor	2,193	491
Verona	3,039	1,675
Vineland	6,799	5,282
Wallington	5,715	3,448
Wanaque	2,916	....
Washington	3,341	3,567
West Hoboken	40,074	35,403
West New York	29,926	13,560
West Orange	15,573	10,980
Westfield	9,063	6,420
Westville	2,380	....
Westwood	2,597	1,870
Wharton	2,877	2,983
Wildwood	2,790	898
Woodbury	5,801	4,642

NEW MEXICO

	1920	1910
Alamogordo	2,363	....
Albuquerque	15,157	11,020
Carlsbad	2,205	1,736
Clayton	2,157	970
Clovis	4,904	3,255
Columbus	2,110	....
Deming	3,212	1,864
Gallup	3,920	2,204
La Cruces	3,969	3,836
Las Vegas	4,304	3,755
Raton	5,544	4,539
Roswell	7,033	6,172
Santa Fe	7,236	5,072
Silver City	2,662	3,217
Tucumcari	3,117	2,526

NEW YORK

	1920	1910
Albany	113,344	100,253
Albion	4,683	5,016
Amityville	3,265	2,517
Amsterdam	33,524	31,267
Attica	2,015	1,869
Auburn	36,192	34,668
Avon	2,585	2,053
Babylon	2,523	2,600
Baldwinsville	3,685	3,099
Ballston Spa	4,103	4,138
Batavia	13,541	11,613
Bath	4,795	3,884
Beacon	10,996	10,629
Binghamton	66,800	48,443
Brockport	2,980	3,579
Bronxville	3,055	1,863
Buffalo	506,775	423,715
Canajoharie	2,415	2,273
Canandaigua	7,356	7,217
Canastota	3,995	3,247
Canisteo	2,201	2,259
Canton	2,631	2,701
Carthage	4,320	3,563
Catskill	4,728	5,296
Cedarhurst	2,838	....
Chatham	2,710	2,251
Clyde	2,528	2,695
Cobleskill	2,410	2,088
Cohoes	22,987	24,709
Cooperstown	2,725	2,484
Corinth	2,576	2,166
Corning	15,820	13,730
Cortland	13,294	11,504

NEW YORK (*Cont.*)

	1920	1910
Coxsackie	2,121	2,494
Croton-on-Hudson	2,286	1,806
Dannemora	2,623	1,146
Dansville	4,631	3,938
Depew	5,850	3,921
Dobbs Ferry	4,401	3,455
Dolgeville	3,448	2,685
Dunkirk	19,336	17,221
East Aurora	3,703	2,781
East Rochester	3,901	2,398
East Rockaway	2,005	1,200
East Syracuse	4,106	3,274
Eastwood	2,194	810
Ellenville	3,116	3,114
Elmira	45,393	37,176
Elmira Heights	4,188	2,732
Endicott	9,500	2,408
Fairport	4,626	3,112
Falconer	2,742	2,141
Farmingdale	2,091	1,567
Floral Park	2,097	1,225
Fort Edward	3,871	3,762
Fort Plain	2,747	2,762
Frankfort	4,198	3,303
Franklinville	2,015	1,568
Fredonia	6,051	5,285
Freeport	8,599	4,836
Fulton	13,043	10,480
Garden City	2,420	....
Geneseo	2,157	2,067
Geneva	14,648	12,446
Glen Cove	8,664	....
Glens Falls	16,638	15,243
Gloversville	22,075	20,642
Goshen	2,843	3,081
Gouverneur	4,143	4,128
Gowanda	2,673	2,012
Granville	3,024	3,920
Grand Island	4,411	4,787
Greenport	3,122	3,089
Greenwich	2,384	2,314
Groton	2,235	1,260
Hamburg	3,185	2,134
Hastings-on-Hudson	5,526	4,552
Haverstraw	5,226	5,669
Hempstead	6,382	4,964
Herkimer	10,453	7,520
Highland Falls	2,588	2,470
Homer	2,356	2,695
Hoosick Falls	4,896	5,532
Hornell	15,025	13,617
Horseheads	2,078	1,778
Hudson	11,745	11,417
Hudson Falls	5,761	5,189
Ilion	10,169	6,588
Irvington	2,701	2,319
Ithaca	17,004	14,802
Jamestown	38,917	31,297
Johnson City	8,587	3,775
Johnstown	10,908	10,447
Kenmore	3,160	1,020
Kingston	26,688	25,908
La Salle	3,813	1,299
Lackawanna	17,918	14,549
Lake Placid	2,099	1,682
Lancaster	6,059	4,363
Larchmont	2,468	1,958
Lawrence	2,861	1,189
Leroy	4,203	3,771
Liberty	2,459	2,072
Little Falls	13,029	12,273
Lockport	21,308	17,970
Lowville	3,127	2,940
Lynbrook	4,371	....
Lyons	4,253	4,460
Malone	7,556	6,467
Mamaroneck	6,571	5,699
Massena	5,993	2,951
Mechanicville	8,166	6,634
Medina	6,011	5,683
Middletown	18,420	15,313
Mineola	3,016	1,981
Mohawk	2,991	2,079
Monticello	2,330	1,941
Mount Kisco	3,944	2,802
Mount Morris	3,312	2,782
Mount Vernon	42,726	30,919
New Rochelle	36,213	28,867
New York	5,620,048	4,766,883

NEW YORK (*Cont.*)

	1920	1910
Newark	6,964	6,227
Newburgh	30,366	27,805
Niagara Falls	50,760	30,445
North Pelham	2,385	1,311
North Tarrytown	5,927	5,421
North Tonawanda	15.482	11,955
Norwich	8,268	7,422
Nyack	4,444	4,619
Ogdensburg	14,609	15,933
Olean	20,506	14,743
Oneida	10,541	8,317
Oneonta	11,582	9,491
Ossining	10,739	11,480
Oswego	23,626	23,368
Owego	4,147	4,633
Painted Post	2,170	1,224
Palmyra	2,480	2.268
Patchogue	4,031	3,824
Peekskill	15,868	15,245
Penn Yan	4,517	4,597
Perry	4,717	4,388
Plattsburg	10,909	11,138
Pleasantville	3,590	2,207
Port Chester	16,573	12,809
Port Henry	2,183	2,266
Port Jervis	10,171	9,564
Potsdam	4,039	4,036
Poughkeepsie	35,000	27,936
Ravena	2,093	....
Rensselaer	10,823	10,711
Rochester	295,750	218,149
Rockville Center	6,262	3,667
Rome	26,341	20,497
Rye	5,308	3,964
Sag Harbor	2,993	3,408
St. Johnsville	2,469	2,536
Salamanca	9,276	5,792
Saranac Lake	5,174	4,983
Saratoga Springs	13,181	12,693
Saugerties	4,013	3,929
Scarsdale	3,506	....
Schenectady	88,723	72,826
Scotia	4,358	2,957
Sea Cliff	2,108	1,694
Seneca Falls	6,389	6,588
Sidney	2,670	2,507
Silver Creek	3,260	2,512
Solvay	7,352	5,139
South Glens Falls	2,158	2,247
Southampton	2,891	2,509
Spring Valley	3,818	2,353
Springville	2,331	2,246
Suffern	3,154	2,663
Syracuse	171,717	137,249
Tarrytown	5,807	5,600
Ticonderoga	2,102	2,475
Tonawanda	10,068	8,290
Troy	72,013	76,813
Tuckahoe	3,509	2,722
Tupper Lake	2,508	3,067
Union	3,303	1,544
Utica	94,156	74,419
Walden	5,493	4,004
Walton	3,598	3,103
Wappingers Falls	3,235	3,195
Warsaw	3,622	3,206
Warwick	2,420	2.318
Waterford	2,637	3,245
Waterloo	3,809	3,931
Watertown	31,285	26,730
Watervliet	16,073	15,074
Watkins	2,785	2,817
Waverly	5,270	4.855
Wellsville	4,996	4,382
West Haverstraw	2,018	2,369
Westfield	3,413	2,985
White Plains	21,031	15,949
Whitehall	5,258	4,917
Whitesboro	3,038	2,375
Yonkers	100,176	79,803

NORTH CAROLINA

	1920	1910
Albemarle	2.691	2,116
Asheboro	2,559	1,865
Asheville	28,504	18,762
Beaufort	2,968	2,483
Belmont	2,941	1,176
Bessemer	2,176	1,529
Burlington	5,952	4,808

Population of United States: Census of 1920 and 1910

NORTH CAROLINA (*Cont.*)	1920	1910
Canton	2,584	1,393
Charlotte	46,338	34,014
Clinton	2,110	1,101
Concord	9,903	8,715
Dunn	2,805	1,823
Durham	21,719	18,241
East Spencer	2,239	1,729
Edenton	2,777	2,789
Elizabeth City	8,925	8,412
Fayetteville	8,877	7,045
Forest City	2,312	1,592
Gastonia	12,871	5,759
Goldsboro	11,296	6,107
Graham	2,366	2,504
Greensboro	19,861	15,895
Greenville	5,772	4,101
Hamlet	3,808	2,173
Henderson	5,222	4,503
Hendersonville	3,720	2,818
Hickory	5,076	3,716
High Point	14,302	9,525
Kings Mountain	2,800	2,218
Kinston	9,771	6,995
Laurinburg	2,643	2,322
Lenoir	3,718	3,364
Lexington	5,254	4,163
Lincolnton	3,390	2,413
Lumberton	2,691	2,230
Monroe	4,084	4,082
Mooresville	4,315	3,400
Morehead	2,958	2,039
Morganton	2,867	2,712
Mount Airy	4,752	3,844
Mount Olive	2,297	1,071
New Bern	12,198	9,961
Newton	3,021	2,316
North Wilkesboro	2,363	1,902
Oxford	3,606	3,018
Raleigh	24,418	19,218
Reidsville	5,333	4,828
Roanoke	3,369	1,670
Rockingham	2,509	2,155
Rocky Mount	12,742	8,051
Salisbury	13,884	7,153
Sanford	2,977	2,282
Scotland Neck	2,061	1,726
Shelby	3,609	3,127
Spencer	2,510	1,915
Statesville	7,895	4,599
Tarboro	4,568	4,129
Thomasville	5,676	3,877
Wadesboro	2,648	2,376
Washington	6,314	6,211
Wilmington	33,372	25,748
Wilson	10,612	6,717
Winston-Salem	48,395	22,700

NORTH DAKOTA	1920	1910
Bismarck	7,122	5,443
Devil's Lake	5,140	5,157
Dickinson	4,122	3,678
Fargo	21,961	14,331
Grafton	2,512	2,229
Grand Forks	14,010	12,478
Jamestown	6,627	4,358
Mandan	4,336	3,873
Minot	10,476	6,188
New Rockford	2,111	....
Valley City	4,686	4,606
Wahpeton	3,069	2,467
Williston	4,178	3,124

OHIO	1920	1910
Ada	2,321	2,465
Akron	208,435	69,067
Alliance	21,603	15,083
Amherst	2,485	2,106
Ashland	9,249	6,795
Ashtabula	22,082	18,266
Athens	6,418	5,463
Barberton	18,811	9,410
Barnesville	4,865	4,233
Bedford	2,677	1,783
Bellaire	15,061	12,946
Bellefontaine	9,336	8,238
Bellevue	5,776	5,209
Berea	2,959	2,609
Bowling Green	5,788	5,222
Bradford	2,356	1,844
Bridgeport	3,977	3,974
Bryan	4,252	3,641
Bucyrns	10,425	8,122
Byesville	2,775	3,156
Cadiz	2,084	1,971
Cambridge	13,104	11,327
Canton	87,091	50,217
Carey	2,488	2,225
Carrollton	2,192	1,730
Celina	4,226	3,493
Chagrin Falls	2,237	1,931
Cheviot	4,108	1,930
Chillicothe	15,831	14,508
Cincinnati	401,247	363,591
Circleville	7,049	6,744
Cleveland	796,841	560,663
Cleveland Heights	15,236	2,955
Clyde	3,099	2,815
Columbiana	2,114	1,582
Columbus	237,031	181,511
Conneaut	9,343	8,319
Coshocton	10,847	9,603
Crestline	4,313	3,807
Crooksville	3,311	3,029
Cuyahoga Falls	10,200	4,020
Dayton	152,559	116,577
Definace	8,876	7,327
Delaware	8,756	9,076
Delphos	5,745	5,038
Dennison	5,524	4,008
Dover	8,101	6,621
East Cleveland	27,292	9,179
East Liverpool	21,411	20,387
East Palestine	5,750	3,537
East Youngstown	11,237	4,972
Eaton	3,210	3,187
Elmwood	3.991	3,423
Elyria	20,474	14,825
Euclid	3,363	1,953
Fairport Harbor	4,211	2,263
Findlay	17,021	14,858
Fostoria	9,987	9,597
Franklin	3,071	2,659
Fremont	12,468	9,939
Galion	7,374	7,214
Gallipolis	6,070	5,560
Garfield Heights	2,550	....
Geneva	3,081	2,496
Girard	6,556	3,736
Glouster	3,140	2,527
Greenfield	4,344	4,228
Greenville	7,104	6,237
Hamilton	39,675	35,279
Hicksville	2,378	2,395
Hillsboro	4,356	4,296
Hubbard	3,320	1,699
Ironton	14,007	13,147
Jackson	5,842	5,468
Kenmore	12,683	1,561
Kent	7,070	4,488
Kenton	7,690	7,185
Lakewood	41,732	15,181
Lancaster	14,706	13,093
Lebanon	3,396	2,698
Leetonia	2,688	2,665
Lima	41,326	30,508
Lisbon	3,113	3,084
Lockland	4,007	3,439
Logan	5,493	4,850
London	4,080	3,530
Lorain	37,295	28,883
Louisville	2,008	1,678
Lowellville	2,214	1,592
Mansfield	27,824	20,768
Marietta	15,140	12,923
Marion	27,891	18,232
Martins Ferry	11,634	9,133
Marysville	3,635	3,576
Massillon	17,428	13,879
Maumee	3,195	2,307
Medina	3,430	2,734
Miamisburg	4,383	4,271
Middleport	3,772	3,194
Middletown	23,594	13,152
Millersburg	2,098	2,020
Minerva	2,261	1,396
Mingo Junction	4,616	4,049
Montpelier	3.052	2,759
Mount Healthy	2.255	1,799
Mount Vernon	9,237	9,087
Napoleon	4,143	4,007
Nelsonville	6,440	6,082
New Boston	4,817	1,858
New Comerstown	3,389	2,943
New Lexington	3,157	2,559
New Philadelphia	10,718	8,542
New Straitsville	2,208	2,242
Newark	26,718	25,404
Newburgn Heights	2,957	940
Niles	13,080	8,361
North Baltimore	2,439	2,503
Norwalk	7,379	7,858
Norwood	24,966	16,185
Oberlin	4,236	4,365
Orrville	4,107	3,101
Ottawa	2,167	2,182
Oxford	2,146	2,017
Painesville	7,272	5,501
Paulding	2,106	2,081
Perrysburg	2,429	1,913
Piqua	15,044	13,388
Pomeroy	4,294	4,023
Port Clinton	3,928	3,007
Portsmouth	33,011	23,481
Ravenna	7,219	5,310
Reading	4,540	3,985
St. Bernard	6,312	5,002
St. Marys	5,679	5,732
Salem	10,305	8,943
Salineville	2,700	2,403
Sandusky	22,897	19,989
Sciotoville	2,182	....
Sebring	3,541	2,104
Shadyside	3,084	....
Shelby	5,578	4,903
Sidney	8,590	6,607
Springfield	60,840	46,921
Steubenville	28,508	22,391
Struthers	5,847	3,370
Tiffin	14,375	11,894
Tippecanoe	2,426	2,038
Toledo	243,164	168,497
Toronto	4,684	4,271
Troy	7,266	6,122
Uhrichsville	6,428	4,751
Upper Sandusky	3,708	3,779
Urbana	7,621	7,739
Van Wert	8,100	7,157
Wadsworth	4,742	3,073
Wapakoneta	5,295	5,349
Warren	27,050	11,081
Washington Court House	7,962	7,277
Wauseon	3,035	2,650
Wellington	2.245	2,131
Wellston	6,687	6,875
Wellsville	8,849	7,769
West Park	8,581	3,179
Westerville	2,480	1,903
Willard	3,889	2,950
Willoughby	2,656	2,072
Wilmington	5,037	4,491
Woodsfield	2,394	2,502
Wooster	8.204	6,136
Wyoming	2,323	1,893
Xenia	9.110	8,706
Youngstown	132,358	79,066
Zanesville	29,569	28,026

OKLAHOMA	1920	1910
Ada	8,012	4,349
Altus	4,522	4,821
Alva	3,913	3,688
Anadarko	3,116	3,439
Ardmore	14.181	8,618
Atoka	2,038	1,968
Bartlesville	14,417	6,181
Beggs	2,327	855
Bigheart	2,099	307
Blackwell	7,174	3,266
Bristow	3,460	1,667
Broken Arrow	2,086	1,576
Cardin	2,640	....
Chandler	2,226	2,024
Checotah	2,390	1,683
Cherokee	2,017	2,016
Chickasha	10,179	10,320
Claremore	3,435	2,866

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OKLAHOMA (*Cont.*)

	1920	1910
Cleveland	2,717	1,310
Clinton	2,596	2,781
Coalgate	3,009	3,255
Collinsville	3,801	1,324
Commerce	2,555	....
Cushing	6,326	1,072
Dewey	2,302	1,344
Drumright	6,460	....
Duncan	3,463	2,477
Durant	7,340	5,330
Edmond	2,452	2,090
El Reno	7,737	7,872
Elk City	2,814	3,165
Enid	16,576	13,799
Eufaula	2,286	1,307
Frederick	3,822	3,027
Guthrie	11,757	11,654
Haileyville	2,067	2,024
Hartshorne	3,480	2,963
Haskell	2,196	857
Healdton	2,157	...
Henryetta	5,889	1,671
Hobart	2,936	3,845
Holdenville	2,932	2,296
Hominy	2,875	760
Hugo	6,368	4,582
Idabel	3,067	1,493
Kingfisher	2,447	2,538
Krebs	2,078	2,884
Lawton	8,930	7,788
McAlester	12,095	12,954
Madill	2,717	1,564
Mangum	3,405	3,667
Marlow	2,276	1,965
Miami	6,802	2,907
Muskogee	30,277	25,278
Newkirk	2,533	1,992
Norman	5,004	3,724
Nowata	4,435	3,672
Oilton	2,231	....
Okemah	2,162	1,389
Oklahoma City	91,295	64,205
Okmulgee	17,430	4,176
Pauls Valley	3,694	2,689
Pawhuska	6,414	2,776
Pawnee	2,418	2,161
Perry	3,154	3,133
Picher	9,676	....
Ponca	7,051	2,521
Poteau	2,679	1,830
Purcell	2,938	2,740
Sallisaw	2,255	2,479
Sand Springs	4,076	....
Sapulpa	11,634	8,283
Shawnee	15,348	12,474
Stillwater	4,701	3,444
Sulphur	3,667	3,684
Tahlequah	2,271	2,891
Tulsa	72,075	18,182
Vinita	5,010	4,082
Wagoner	3,436	4,018
Walters	3.032	1.377
Waurika	3,204	2,928
Wilburton	2,226	2,277
Wilson	2,286	....
Woodward	3,849	2.696
Wynnewood	2,200	2,002
Wynona	2,749	....
Yale	2,601	685

OREGON

	1920	1910
Albany	4,840	4,275
Ashland	4,283	5,020
Astoria	14,027	9,599
Baker	7,729	6,742
Bend	5,415	536
Corvallis	5,752	4,552
Dallas	2.701	2,124
Eugene	10,593	9,009
Grants Pass	3,151	3,897
Hillsboro	2,468	2,016
Hood River	3,195	2,331
Klamath Falls	4,801	2,758
La Grande	6,913	4,843
McMinnville	2,767	2,400
Marshfield	4.034	2,980
Medford	5,756	8,840
Newberg	2,566	2,260
North Bend	3,268	2,078
Ontario	2,039	1,248
Oregon City	5,686	4,287
Pendleton	7,387	4,460
Portland	258,288	207,214
Roseburg	4,381	4,738
St. Helens	2,220	742
Salem	17,679	14,094
Silverton	2,251	1,588
The Dalles	5,807	4,880

PENNSYLVANIA

	1920	1910
Aliquippa	2,931	1,743
Allentown	73,502	51,913
Altoona	60,331	52,127
Ambler	3,094	2,649
Ambridge	12,730	5,205
Apollo	3,227	3,006
Archbald	8,603	7,194
Arnold	6,120	1,818
Ashland	6,666	6,855
Ashley	6,520	5,601
Aspinwall	3,170	2,592
Athens	4,384	3,796
Avalon	5,277	4,317
Avoca	4,950	4,634
Bangor	5,402	5,369
Barnesboro	4,183	3,535
Beaver	4,135	3,456
Beaver Falls	12,802	12,191
Bedford	2,330	2,235
Bellefonte	3,996	4,145
Bellevernon	2,342	2,372
Bellevue	8,198	6,323
Bellwood	2,629	2,277
Ben Avon	2,198	1,828
Bentleyville	3.679	1,922
Berwick	12,181	5,357
Bethlehem	50,358	12,837
Birdsboro	3,299	2,930
Blairsville	4,391	3,572
Blakely	6,564	5,345
Bloomsburg	7,819	7,413
Blossburg	2,033	2,303
Boswell	2,168	1,878
Boyertown	3,189	2,433
Brackenridge	4,987	3,134
Braddock	20,879	19,357
Bradford	15,525	14,544
Bridgeport	4,680	3,860
Bridgeville	3,092	1,983
Bristol	10,273	9,256
Brockwayville	2,369	1,898
Brookville	3.272	3,003
Brownsville	2,502	2,324
Burnham	2,765	....
Butler	23,778	20,728
California	2,480	2,230
Canonsburg	10,632	3,891
Canton	2,154	1,637
Carbondale	18,640	17,040
Carlisle	10,916	10,303
Carnegie	11,516	10,009
Carrick	10,504	6,117
Castle Shannon	2,353	....
Catasauqua	4,714	5,250
Catawissa	2,025	1,930
Centerville	4,793	1,413
Centralia	2,336	2,429
Chambersburg	13,171	11,800
Charleroi	11,516	9,615
Chester	58,030	38,537
Clairton	6,264	3,326
Clarion	2,793	2,612
Clearfield	8,529	6,851
Clifton Heights	3,469	3,155
Clymer	2,867	1,753
Coaldale	6,336	5,154
Coatesville	14,515	11,084
College Hill	2,643	1,787
Collingdale	3,834	1,361
Columbia	10,836	11,454
Connellsville	13,804	12,845
Conshohocken	8,481	7,480
Coplay	2,845	2,670
Coraopolis	6,162	5,252
Corry	7,228	5,991
Coudersport	2,836	3,100
Crafton	5,954	4,583
Cresson	2,170	1,470
Curwensville	2,973	2,549
Dale	3,115	2,285
Dallastown	2,124	1,884
Danville	6,952	7,517
Darby	7,922	6,305
Derry	2,889	2,954
Dickson City	11,049	9,331
Donora	14,131	8,174
Dormont	6,455	1,115
Dorranceton	6,334	4,046
Downington	4,024	3,326
Doylestown	3,837	3,304
Dravosburg	2,204	1,895
Du Bois	13,681	12,623
Dunmore	20,250	17,615
Dupont	4,576	....
Duquesne	19,011	15,727
Duryea	7,776	7,487
East Conemaugh	5,256	5,046
East McKeesport	2,430	2,118
East Mauch Chunk	3,868	3,548
East Pittsburgh	6,527	5,615
East Stroudsburg	4,855	3,330
Easton	33,813	28,523
Ebensburg	2,179	1,978
Eddystone	2,670	1,167
Edgewood	3,181	2,596
Edwardsville	9,027	8,407
Elizabeth	2,703	2,311
Elizabethtown	3,319	2,587
Ellsworth	2,828	2,084
Ellwood City	8,958	3,902
Emaus	4,370	3,501
Emporium	3,036	2,916
Emsworth	2,165	1,510
Ephrata	3,735	3,192
Erie	93,372	66,525
Etna	6,341	5,830
Exeter	4,176	3,537
Export	2,596	....
Fairchance	2,124	1,760
Farrell	15,586	10,190
Fayette City	2,048	2,005
Ford City	5,605	4,850
Forest City	6,004	5,749
Forty Fort	3,389	2,353
Fountain Hill	2,339	1,388
Frackville	5,590	3,118
Franklin (borough)	2,632	2,102
Franklin (city)	9,970	9,767
Freedom	3,452	3,060
Freeland	6,666	6,197
Freeport	2,696	2,248
Galeton	2,969	4,027
Gallitzin	3,580	3,504
Gettysburg	4,439	4,030
Gilberton	4,766	5,401
Girardville	4,482	4,396
Glassport	6,959	5,540
Glenfield	2,156	984
Greencastle	2,271	1,919
Greensburg	15,033	13,012
Greenville	8,101	5,909
Grove City	4,944	3,674
Hamburg	2,764	2,301
Hanover	8,664	7,057
Harrisburg	75,917	64,186
Hastings	2,292	2,125
Hays	2,231	1,888
Hazleton	32.277	25,452
Heidelberg	2,094	1,848
Hellertown	3,008	915
Highspire	2,031	1,669
Hollidaysburg	4,071	3,734
Homestead	20,452	18,713
Honesdale	2,756	2,945
Hughestown	2,244	2,024
Hummelstown	2,654	2,128
Huntingdon	7,051	6,861
Indiana	7,043	5,749
Ingram	2,900	2,037
Irwin	3,235	2,886
Jeannette	10,627	8,077
Jenkintown	3,366	2,968
Jermyn	3,326	3,158
Jersey Shore	6,103	5,381
Johnsonburg	5,400	4,334
Johnstown	67,327	55,482
Juniata	7,660	5,285

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PENNSYLVANIA (*Cont.*)	1920	1910
Kane	7,283	6,626
Kennett Square	2,398	2,049
Kingston	8,952	6,449
Kittanning	7,153	4,311
Knoxville	7,201	5,651
Kulpmont	4,695	....
Kutztown	2,684	2,360
Lancaster	53,150	47,227
Lansdale	4,728	3,551
Lansdown	4,797	4,066
Lansford	9.625	8,321
Larksville	9,438	9,288
Latrobe	9,484	8,777
Lebanon	24,643	19,240
Lebanon Independent	2,136	....
Leechburg	3,991	3,624
Leetsdale	2,311	1,904
Lehighton	6,102	5,316
Lewisburg	3,204	3,081
Lewistown	9,849	8,166
Lilly	2,346	1,638
Lititz	3,680	2,082
Lock Haven	8,557	7,772
Luzerne	5,998	5,426
Lykens	2,880	2,943
McAdoo	4,674	3,389
McDonald	2,751	2,543
McKees Rocks	16,713	14,702
McKeesport	46,781	42,694
Mahanoy City	15,599	15,936
Manheim	2,712	2,202
Marcus Hook	5,324	1,573
Mauch Chunk	3,666	3,952
Mayfield	3,832	3,662
Meadville	14,568	12,780
Mechanicsburg	4,688	4,469
Media	4,109	3,562
Meyersdale	3,716	3,741
Middletown	5,920	5,374
Midland	5,452	1,244
Millersburg	2,936	2,394
Millvale	8,031	7,861
Milton	8,638	7,460
Miners Mills	4,365	3,159
Minersville	7,845	7,240
Monaca	3,838	3,376
Monessen	18,179	11,775
Monongahela	8,688	7,598
Moosic	4,364	3,964
Morrisville	3,639	2,002
Mount Carmel	17,469	17,532
Mount Joy	2,192	2,166
Mount Oliver	5,575	4,241
Mount Pleasant	5,862	5,812
Mount Union	4,744	3,338
Muncy	2,054	1,904
Munhall	6,418	5,185
Myerstown	2,385	....
Nanticoke	22,614	18,877
Nanty-Glo	5,028	....
Narberth	3,704	1,790
Nazareth	4,288	3,978
New Brighton	9,361	8,329
New Castle	44,938	36,280
New Kensington	11,987	7,707
New Philadelphia	2,537	2,512
Norristown	32,319	27,875
North Bellevernon	2,605	1,522
North Braddock	14,928	11,824
North Catasauqua	2,321	2,030
North East	3,481	2,672
North Wales	2,041	1,710
North York	2,239	1,902
Northampton	9,349	8,729
Northampton Heights	3,791	1,037
Northumberland	4,061	3,517
Norwood	2,353	1,668
Oakmont	4,512	3,436
Oil City	21,274	15,657
Old Forge	12,237	11,324
Olyphant	10,236	8,505
Osceola	2,512	2,437
Overbrook	2,185	....
Oxford	2,093	2,390
Palmerton	7,168	....
Palmyra	3,646	....
Parkesburg	2,543	2,522
Parnassus	3,816	2,578
Parsons	5,628	4,338

PENNSYLVANIA (*Cont.*)	1920	1910
Patton	3,628	3,907
Pen Argyl	4,096	3,967
Penbrook	2,072	1,462
Perkasie	3,150	2,779
Philadelphia	1,823,779	1,549,008
Philipsburg	3,900	3,585
Phoenixville	10,484	10,743
Pitcairn	5.738	4,975
Pittsburgh	588,343	533,905
Pittston	18,497	16,267
Plymouth	16,500	16,996
Polk	2,662	2,066
Port Allegany	2,356	1,972
Port Carbon	2,882	2,678
Port Vue	2,538	1,978
Portage	4,804	2,954
Pottstown	17,431	15,599
Pottsville	21,876	20,236
Prospect Park	2,536	1,655
Punxsutawney	10,311	9,058
Quakertown	4,391	3,801
Rankin	7,301	6,042
Reading	107,784	96,071
Red Lion	3,198	2,092
Renova	5,877	4,621
Reynoldsville	4,116	3,189
Ridgway	6,037	5,408
Ridley Park	2,313	1,761
Roaring Spring	2,379	1,903
Rochester	6,957	5,903
Royersford	3,278	3,073
St. Clair (Allegheny County)	6,585	5,640
St. Clair (Schuylkill County)	6,495	6,455
St. Marys	6,967	6,346
Sayre	8,078	6,426
Schuylkill Haven	5,437	4,747
Scottdale	5,768	5.456
Scranton	137,783	129,867
Sewickley	4,955	4,479
Shamokin	21,204	19,588
Sharon	21,747	15,270
Sharpsburg	8,921	8,153
Sharpsville	4,674	3,634
Shenandoah	24,726	25,774
Shickshinny	2,289	1,917
Shillington	2,175	1,427
Shippensburg	4,372	3,457
Slatington	4,014	4,454
Somerset	3,121	2,612
Souderton	3,125	1,875
South Allentown	2,549	1,814
South Brownsville	4,675	3,943
South Connellsville	2,196	....
South Fork	4,239	4,592
South Greensburg	2,188	1,748
South Williamsport	4,341	3,734
SouthwestGreensburg	2,538	2,127
Spangler	3,035	2,700
Spring City	2,944	2,880
Springdale	2,929	1,999
State College	2,405	1,425
Steelton	13,428	14,246
Stroudsburg	5,278	4,379
Sugar Notch	2,612	2,439
Summit Hill	5,499	4,209
Sunbury	15,721	13,770
Susquehanna Depot	3,764	3,478
Swarthmore	2,350	1,899
Swissvale	10,908	7,381
Swoyersville	6,876	5,396
Sykesville	2,507	1,756
Tamaqua	12,363	9,462
Tarentum	8,925	7,414
Taylor	9,876	9,060
Throop	6,672	5,133
Titusville	8,432	8,533
Towanda	4,269	4,281
Tower City	2,324	2,325
Trafford	2,859	1,959
Tremont	2,015	2,067
Turtle Creek	8,138	4,995
Tyrone	9,084	7,176
Union City	3,850	3,684
Uniontown	15,692	13,344
Upland	2,486	2,221
Vandergrift	9,531	3,876
Verona	3,938	2,849

PENNSYLVANIA (*Cont.*)	1920	1910
Vintondale	2,053	1,410
Wall	2,426	1,962
Warren	14,272	11,080
Washington	21,480	18,778
Watsontown	2,153	1,950
Waynesboro	9,720	7,199
Waynesburg	3,332	3,545
Weatherly	2,356	2,501
Wellsboro	3,452	3,183
West Chester	11,717	11,767
West Conshohocken	2,331	2,202
West Hazleton	5,854	4,715
West Homestead	3,435	3,009
West Newton	2,645	2,880
West Pittston	6,968	6,848
West Reading	2,921	2,064
West York	3,320	2,435
Westview	2,797	1,626
Wilkes-Barre	73,833	67,105
Wilkinsburg	24,403	18,924
Williamsport	36,198	31,860
Williamstown	2,878	2,904
Wilmerding	6,441	6,133
Wilson	3,243	1,108
Windber	9,462	8,013
Winton	7,583	5,280
Woodlawn	12,495	1,396
Wyoming	3,582	3,010
Wyomissing	2,062	985
York	47,512	44,750
Youngwood	2,275	1,881

RHODE ISLAND		
Barrington	3,897	2,452
Bristol	11,375	8,565
Burrillville	8,606	7,878
Central Falls	24,174	22,754
Coventry	5,670	5,848
Cranston	29,407	21,107
Cumberland	10,077	10,107
East Greenwich	3,290	3,420
East Providence	21,793	15,808
Johnston	6,855	5,935
Lincoln	9,543	9,825
Newport	30,255	27,149
North Kingstown	3,397	4,048
North Providence	7,697	5,407
North Smithfield	3,200	2,699
Pawtucket	64,248	51,622
Portsmouth	2,590	2,681
Providence	237,595	224,326
Scituate	3,006	3,493
Smithfield	3,199	2,739
South Kingstown	5,181	5,176
Tiverton	3,894	4,032
Warren	7,841	6,585
Warwick	13,481	26,629
West Warwick	15,461	....
Westerly	9,952	8,696
Woonsocket	43,496	38,125

SOUTH CAROLINA		
Abbeville	4,570	4,459
Aiken	4,103	3,911
Anderson	10,570	9,654
Bamberg	2,210	1,937
Batesburg	2,848	1,995
Beaufort	2,831	2,486
Bennettsville	3,197	2,646
Bishopville	2,090	1,659
Camden	3,930	3,569
Charleston	67,957	58,833
Cheraw	3,150	2,873
Chester	5,557	4,754
Clinton	3,767	3,272
Columbia	37,524	26,319
Darlington	4,669	3,789
Dillon	2,205	1,757
Easley	3,568	2,983
Eau Claire	2,566	1,234
Florence	10,968	7,057
Gaffney	5,065	4,767
Georgetown	4,579	5,530
Greenville	23,127	15,741
Greenwood	8,703	6,614
Greer	2,292	1,673
Hartsville	3,624	2,365
Kingstree	2,074	1,372
Lancaster	3,032	2,098

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SOUTH CAROLINA (*Cont.*)

	1920	1910
Laurens	4,629	4,818
McColl	2,129	1,628
Manning	2,022	1,854
Marion	3,892	3,844
Mullins	2,379	1,832
Newberry	5,894	5,028
Orangeburg	7,290	5,906
Rock Hill	8,809	7,216
Spartanburg	22,638	17,517
Summerville	2,550	2,355
Sumter	9,508	8,109
Union	6,141	5,623
Walhalla	2,068	1,595
Williamston	2,322	1,957
Woodruff	2,396	1,880
Yorkville	2,731	2,326

SOUTH DAKOTA

	1920	1910
Aberdeen	14,537	10,753
Brookings	3,924	2,971
Canton	2,225	2,103
Deadwood	2,403	3,653
Hot Springs	2,141	2,140
Huron	8,302	5,791
Lead	5,013	8,392
Madison	4,144	3,137
Milbank	2,215	2,015
Mitchell	8,478	6,515
Mobridge	3,517	1,200
Pierre	3,209	3,656
Rapid City	5,777	3,854
Redfield	2,755	2,856
Sioux Falls	25,202	14,094
Vermilion	2,590	2,187
Watertown	9,400	7,010
Winner	2,000	....
Yankton	5,024	3,787

TENNESSEE

	1920	1910
Alcoa	3,358	....
Alton Park	3,020	....
Athens	2,580	2,264
Bristol	8,047	7,148
Brownsville	3,062	2,882
Chattanooga	57,895	44,604
Clarksville	8,110	8,548
Cleveland	6,522	5,549
Columbia	5,526	5,754
Cookeville	2,395	1,848
Covington	3,410	2,990
Dickson	2,263	1,850
Dyersburg	6,444	4,149
East Chattanooga	4,720	....
Elizabethton	2,749	2,478
Erwin	2,965	1,149
Etowah	2,516	1,685
Fayetteville	3,629	3,439
Franklin	3,123	2,924
Gallatin	2,757	2,399
Greeneville	3,775	1,920
Harriman	4,019	3,061
Humboldt	3,913	3,446
Jackson	18,860	15,779
Johnson City	12,442	8,502
Kingsport	5,692	....
Knoxville	77,818	36,346
La Follette	3,056	2,816
Lawrenceburg	2,461	1,687
Lebanon	4,084	3,659
Lenoir City	4,210	3,392
Lewisburg	2,711	1,830
McMinnville	2,814	2,299
Martin	2,837	2,228
Maryville	3,739	2,381
Memphis	162,351	131,105
Milan	2,057	1,605
Morristown	5,875	4,007
Mount Pleasant	2,093	1,973
Murfreesboro	5,367	4,679
Nashville	118,342	110,364
Newport	2,753	2,003
North Chattanooga	2,196	....
Paris	4,730	3,881
Pulaski	2,780	2,928
Ripley	2,070	2,011
Rockwood	4,652	3,660
St. Elmo	3,890	2,426
Shelbyville	2,912	2,869
South Pittsburg	2,356	2,106
Springfield	3,860	2,085
Tracy City	2,669	....

TENNESSEE (*Cont.*)

	1920	1910
Trenton	2,751	2,402
Tullahoma	3,479	3,049
Union City	4,412	4,389
Winchester	2,203	1,351

TEXAS

	1920	1910
Abilene	10,274	9,204
Amarillo	15,494	9,957
Arlington	3,031	1,794
Athens	3,176	2,261
Austin	34,876	29,860
Ballinger	2,767	3,536
Bay City	3,454	3,156
Beaumont	40,422	20,640
Beeville	3,063	3,269
Belton	5,098	4,164
Big Spring	4,273	4,102
Bonham	6,008	4,844
Bowie	3,179	2,874
Brady	2,197	2,669
Brenham	5,066	4,718
Brownsville	11,791	10,517
Brownwood	8,223	6,967
Bryan	6,307	4,132
Burkburnett	5,300	....
Calvert	2,099	2,579
Cameron	4,298	3,263
Canadian	2,187	1,648
Childress	5,003	3,818
Cisco	7,422	2,410
Clarendon	2,456	1,946
Clarksville	3,386	2,065
Cleburne	12,820	10,364
Coleman	2,868	3,046
Comanche	3,524	2,756
Commerce	3,842	2,818
Cooper	2,563	1,513
Corpus Christi	10,522	8,222
Corsicana	11,356	9,749
Crockett	3,061	3,947
Cuero	3,671	3,109
Dalhart	2,676	2,580
Dallas	158,976	92,104
De Leon	3,302	1,015
Decatur	2,205	1,651
Del Rio	10,589	....
Denison	17,065	13,632
Denton	7,626	4,732
Desdemona	3,008	....
Dublin	3,229	2,551
Eagle Lake	2,017	1,717
Eagle Pass	5,765	3,536
Eastland	9,368	855
El Paso	77,560	39,279
Electra	4,744	640
Ennis	7,224	5,669
Farmersville	2,167	1,848
Fort Worth	106,482	73,312
Gainesville	8,648	7,624
Galveston	44,255	36,981
Gatesville	2,499	1,929
Georgetown	2,871	3,096
Gilmer	2,268	1,484
Gonzales	3,128	3,139
Gorman	3,200	963
Graham	2,544	1,569
Greenville	12,384	8,850
Hamilton	2,018	1,548
Haskell	2,300	2,436
Hearne	2,741	2,352
Henderson	2,273	....
Henrietta	2,563	2,104
Highland Park	2,321	....
Hillsboro	6,952	6,115
Honey Grove	2,642	2,300
Houston	138,276	78,800
Hubbard	2,072	1,843
Huntsville	4,689	2,072
Iowa Park	2,041	603
Jacksonville	3,723	2,875
Jefferson	2,549	2,515
Kaufman	2,501	1,959
Kenedy	2,015	1,147
Kerrville	2,353	1,843
Kingsville	4,770	....
Lampasas	2,107	2,119
Laredo	22,710	14,855
Lockhart	3,731	2,945
Longview	5,713	5,155
Lubbock	4,051	1,938

TEXAS (*Cont.*)

	1920	1910
Lufkin	4,878	2,749
McAllen	5,331	....
McGregor	2,081	1,864
McKinney	6,677	4,714
Magnolia Park	4,080	....
Marfa	3,553	....
Marlin	4,310	3,878
Marshall	14,271	11,452
Mart	3,105	2,939
Memphis	2,839	1,936
Mercedes	3,414	1,209
Mexia	3,482	2,694
Mineola	2,299	1,706
Mineral Wells	7,890	3,950
Mission	3,847	....
Mount Pleasant	4,099	3,137
Nacogdoches	3,546	3,369
Navasota	5,060	3,284
New Braunfels	3,590	3,165
Orange	9,212	5,527
Palestine	11,039	10,482
Paris	15,040	11,269
Pearsall	2,161	1,799
Pittsburg	2,540	1,916
Plainview	3,989	2,829
Polytechnic	4,336	....
Port Arthur	22,251	7,663
Quanah	3,691	3,127
Ranger	16,205	....
Rockdale	2,323	2,073
Rusk	2,348	1,558
San Angelo	10,050	10,321
San Antonio	161,379	96,614
San Benito	5,070	....
San Marcos	4,527	4,071
San Saba	2,011	....
Sequin	3,631	3,116
Seymour	2,121	2,029
Sherman	15,031	12,412
Smithville	3,204	3,167
Snyder	2,179	2,514
Sour Lake	3,032	....
Stamford	3,704	3,902
Stephenville	3,891	2,561
Strawn	2,457	....
Sulphur Springs	5,558	5,151
Sweetwater	4,307	4,176
Taylor	5,965	5,314
Teague	3,306	3,288
Temple	11,033	10,993
Terrell	8,349	7,050
Texarkana	11,480	9,790
Texas City	2,509	....
Tyler	12,085	10,400
Uvalde	3,885	3,998
Vernon	5,142	3,195
Victoria	5,957	3,673
Waco	38,500	26,425
Waxahachie	7,958	6,205
Weatherford	6,203	5,074
Wharton	2,346	1,505
Wichita Falls	40,079	8,200
Winnsboro	2,184	1,741
Yoakum	6,184	4,657

UTAH

	1920	1910
American Fork	2,763	2,797
Bingham Canyon	2,676	2,881
Bountiful	2,063	1,677
Brigham	5,282	3,685
Cedar	2,462	1,705
Ephraim	2,287	2,296
Eureka	3,608	3,416
Lehi	3,078	2,964
Logan	9,439	7,522
Manti	2,412	2,423
Midvale	2,209	1,760
Mount Pleasant	2,415	2,280
Murray	4,584	4,057
Nephi	2,603	2,759
Ogden	32,804	25,580
Park City	3,393	3,439
Payson	3,031	2,397
Price	2,364	1,021
Provo	10,303	8,925
Richfield	3,262	2.559
St. George	2,215	1,737
Salt Lake	118,110	92,777
Smithfield	2,421	1,865
Spanish Fork	4,036	3,464

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UTAH (*Cont.*)

	1920	1910
Springville	3,010	3,356
Sunnyside	2,072	....
Tooele	3,602	2,753

VERMONT

	1920	1910
Barre	10,008	10,734
Bellows Falls	4,860	4,883
Bennington	7,230	6,211
Brattleboro	7,324	6,517
Burlington	22,779	20,468
Fair Haven	2,182	2,554
Montpelier	7,125	7,856
Newport	4,976	2,548
Proctor	2,692	2,756
Rutland	14,954	13,546
St. Albans	7,588	6,381
St. Johnsbury	7,164	6,693
Springfield	5,283	3,250
Windsor	3,061	1,906
Winooski	4,932	4,520

VIRGINIA

	1920	1910
Abingdon	2,532	1,757
Alexandria	18,060	15,329
Appalachia	2,036	1,090
Basic City	2,212	1,632
Bedford	3,243	2,508
Big Stone Gap	3,009	2,590
Bristol	6,729	6,247
Buena Vista	3,911	3,245
Cape Charles	2,517	1,948
Charlottesville	10,688	6,765
Clifton Forge	6,164	5,748
Covington	5,623	4,234
Crewe	2,097	1,802
Danville	21,539	19,020
Farmville	2,586	2,971
Franklin	2,363	2,271
Fredericksburg	5,882	5,874
Fries	2,029	1,775
Graham	2,752	1,917
Hampton	6,138	5,505
Harrisonburg	5,875	4,879
Lexington	2,870	2,931
Lynchburg	30,070	29,494
Marion	3,253	2,727
Martinsville	4,075	3,363
Newport News	35,596	20,205
Norfolk	115,777	67,452
Norton	3,068	1,866
Petersburg	31,012	24,127
Phoebus	3,043	2,394
Pocahontas	2,591	2,452
Portsmouth	54,387	33,190
Pulaski	5,282	4,807
Radford	4,627	4,202
Richmond	171,667	127,628
Roanoke	50,842	34,874
Salem	4,159	3,849
Saltville	2,248	1,628
South Boston	4,338	3,516
South Norfolk	7,724	....
Staunton	10,623	10,604
Suffolk	9,123	7,008
Vinton	2,779	1,928
Williamsburg	2,462	2,714
Winchester	6,883	5,864
Wytheville	2,947	3,054

WASHINGTON

	1920	1910
Aberdeen	15,337	13,660
Anacortes	5,284	4,168
Auburn	3,163	957
Bellingham	25,585	24,298
Blaine	2,254	2,289
Bremerton	8,918	2,993
Centralia	7,549	7,311
Charleston	3,338	1,062
Chehalis	4,558	4,507
Cle Elum	2,661	2,749
Colfax	3,027	2,783
Dayton	2,695	2,389
Ellensburg	3,967	4,209
Everett	27,644	24,814
Hillyard	3,942	3,276
Hoquiam	10,058	8,171
Kelso	2,228	2,039
Kent	2,282	1,908
Medical Lake	2,545	1,730
Montesano	2,158	2,488
Mount Vernon	3,341	2,381

WASHINGTON (*Cont.*)

	1920	1910
Olympia	7,795	6,996
Pasco	3,362	2,083
Port Angeles	5,351	2,286
Port Townsend	2,847	4,181
Pullman	2,440	2,602
Puyallup	6,323	4,544
Raymond	4,260	2,450
Renton	3,301	2,740
Roslyn	2,673	3,126
Seattle	315,312	237,194
Sedro-Woolley	3,389	2,129
Snohomish	2,985	3,244
Spokane	104,437	104,402
Tacoma	96,965	83,743
Toppenish	3,120	1,598
Vancouver	12,637	9,300
Walla Walla	15,503	19,364
Wenatchee	6,324	4,050
Yakima	18,539	14,082

WEST VIRGINIA

	1920	1910
Beckley	4,149	2,161
Benwood	4,773	4,976
Bluefield	15,282	11,188
Buckhannon	3,785	2,225
Cameron	2,404	1,660
Charles Town	2,527	2,662
Charleston	39,608	22,996
Chester	3,283	3,184
Clarksburg	27,869	9,201
Davis	2,491	2,615
Elkins	6,788	5,260
Fairmont	17,851	9,711
Follansbee	3.135	2,031
Grafton	8,517	7,563
Hinton	3,912	3,656
Huntington	50,177	31,161
Kenova	2,162	992
Keyser	6,003	3,705
Logan	2,998	1,640
McMechen	3,356	2,921
Mannington	3,673	2,672
Martinsburg	12,515	10,698
Monongah	2.031	2,084
Montgomery	2,130	1,888
Morgantown	12,127	9,150
Moundsville	10,669	8,918
New Martinsville	2,341	2,176
Parkersburg	20.050	17,842
Parsons	2,001	1,780
Piedmont	2,835	2,054
Point Pleasant	3,059	2,045
Princeton	6,224	3,027
Richwood	4,331	3,061
Ronceverte	2,319	2,157
St. Albans	2,825	1,209
Salem	2,920	2,169
Sistersville	3,238	2,684
South Charleston	3,650	....
Thomas	2,099	2,354
Welch	3,232	1,526
Wellsburg	4,918	4,189
Weston	5,701	2,213
Wheeling	56,208	41,641
Williamson	6,819	3,561

WISCONSIN

	1920	1910
Antigo	8,451	7,196
Appleton	19,561	16,773
Ashland	11,334	11,594
Baraboo	5,538	6.324
Beaver Dam	7,992	6,758
Beloit	21,284	15,125
Berlin	4,400	4,636
Burlington	3,626	3,212
Chippewa Falls	9,130	8,893
Clintonville	3,275	1,747
Columbus	2.460	2,523
Cudahy	6.725	3.691
De Pere	5,165	4,477
Delavan	3,016	2,450
Eau Claire	20,906	18,310
Edgerton	2,688	2,513
Evansville	2,209	2,061
Fon du Lac	23,427	18,797
Fort Atkinson	4,915	3,877
Green Bay	31,017	25,236
Hartford	4.515	2,982
Horicon	2,134	1,881

WISCONSIN (*Cont.*)

	1920	1910
Hudson	3,014	2,810
Hurley	3,188	....
Janesville	18,293	13,894
Jefferson	2,572	2,582
Kauhauna	5,951	4,717
Kenosha	40,472	21,371
La Cross	30,421	30,417
Ladysmith	3,581	2,352
Lake Geneva	2,632	3,079
Lancaster	2,485	2,329
Little Chute	2,017	1,354
Madison	38,378	25,531
Manitowoc	17,563	13,027
Marinette	13,610	14,610
Marshfield	7,394	5,783
Mayville	3,011	2,282
Menasha	7,214	6,081
Menomonie	5,401	5,036
Merrill	8,068	8,689
Milwaukee	457,147	373,857
Mineral Point	2,569	2,925
Monroe	4,788	4,410
Nennah	7,171	5,734
Neillsville	2,160	1,957
New London	4,667	3,383
New Richmond	2,248	1,988
North Fond du Lac	2,150	1,960
North Milwaukee	3,047	1,860
Oconomowoc	3,301	3,054
Oconto	4,920	5,629
Oshkosh	33,162	33,062
Park Falls	2,676	1,972
Platteville	4,353	4,452
Plymouth	3,415	3,094
Port Washington	5,340	3,792
Portage	5,582	5,440
Prairie du Chien	3,537	3,149
Racine	58,593	38,002
Reedsburg	2,997	2,615
Rhinelander	6,654	5,637
Rice Lake	4,457	3,968
Richland Center	3,409	2,652
Ripon	3,929	3,739
River Falls	2,273	1,991
Shawano	3,544	2.923
Sheboygan	30,955	26,398
Sheboygan Falls	2,002	1,630
Shorewood	2,650	707
South Milwaukee	7,598	6,092
Sparta	4.466	3,973
Spooner	2,293	1,453
Stanley	2,577	2,675
Stevens Point	11,371	8,692
Stoughton	5,101	4,761
Sturgeon Bay	4,553	4,262
Superior	39,671	40,384
Tomah	3.257	3,419
Tomahawk	2,898	2,907
Two Rivers	7,305	4,850
Viroqua	2,574	2,059
Washburn	3,707	3,830
Watertown	9,299	8,829
Waukesha	12,558	8,740
Waupaca	2,839	2,789
Waupun	4,440	3,362
Wausau	18,661	16,560
Wauwatosa	5,818	3,346
West Allis	13,745	6,645
West Bend	3,378	2,462
West Milwaukee	2,101	1,458
Whitewater	3.215	3,224
Wisconsin Rapids	7,243	6,521

WYOMING

	1920	1910
Casper	11,447	2,639
Cheyenne	13,829	11,320
Douglas	2,294	2,246
Evanston	3,479	2,583
Green River	2,140	1,313
Greybull	2,692	258
Lander	2,133	1,812
Laramie	6,301	8,237
Lusk	2,092	414
Powell	2.463	....
Rawlins	3,969	4,256
Riverton	2,020	483
Rock Springs	6,456	5,778
Sheridan	9,175	8,408
Thermopolis	2,095	1,524

mining, and metallurgical exhibits, along with those showing the progress made in science and education; the Machinery Building, 1,402 by 360 feet; Agricultural Hall, 820 by 540 feet; Horticultural Hall, 383 by 193 feet; Memorial Hall, 365 by 210 feet, used as the art gallery, and now known as the Pennsylvania Museum of Industrial Art.

Besides the individual States, about fifty foreign countries sent exhibits. The total number of admissions was 9,910,966, including 8,004,000 paid admissions. On Pennsylvania Day (Sept. 28) 274,919 persons passed through the gates.

The Centennial Exhibition was not only the first great international exposition held in the United States, but it was one of the largest held anywhere. By many it is regarded as typifying the emergence of this country from its traditional isolation, and as a great concrete illustration of the nation's commercial and industrial importance. It not only served as an effective object lesson in showing the material progress of the nation, but it played an important part in unifying the different sections of the country by bringing together their diverse products, and thus making them familiar with the industrial characteristics of one another.

See EXHIBITIONS. A history of the Centennial Exhibition was issued in nine volumes in 1880 by the U. S. Department of State.

Centennial State, a popular name for Colorado, because it was admitted into the Union in the centennial year, 1876.

Center. See CENTRE.

Centering, the framework upon which an arch or vault of stone, brick, or iron is supported during its construction. The simplest form of centering is that used by masons and bricklayers for the arches of common windows and doors. This is merely a deal board of the required shape, upon the curved edge of which the bricks or stones of the arch are supported until they are keyed in.

In building bridges or other structures, where arches of great span are to be constructed, the centering is usually made of framed timbers, or timbers and iron combined. The arrangement of the timbers should be such that the strain upon each shall be mainly a thrust in the direction of its length, for if the strain were transverse, a comparatively slight force would snap it, and if a longitudinal pull, the whole structure would be no stronger than the joints holding the pieces of timber together. In arches of great span, a longitudinal pulling strain is almost inevitable in some parts, as a beam of great length would bend to some extent under a thrusting strain. In such cases great skill and care are demanded in the designing and construction of the joints. As an arch is built from the piers toward the keystone, the weight upon the haunches during construction tends to push the crown upwards, and therefore the problem of designing a framed centering involves the resistance of this tendency, as well as the supporting of the weight of the materials. Occasionally, when a very great span is required, and the navigation will permit, piers are built on the bed of the river, or piles are driven into it, to support the centering directly, simplifying it, and at the same time facilitating a more rigid disposition than in centering supported only from the sides.

Cupolas, like those of the Pantheon and St. Peter's at Rome, St. Paul's in London, or the flat domes of the Turkish mosques, require very effective centerings. See CARPENTRY.

Centerville, city, Iowa, county seat of Appanoose county, on the Chicago, Rock Island, and Pacific, and the Chicago, Burlington, and Quincy Railroads; 72 miles southeast of Des Moines. It is a shipping point for live stock, lumber, coal, and limestone. There are railway repair shops, and manufactures of iron, lumber, flour, brick, and textiles. Pop. (1900) 5,256; (1910) 6,936.

Centigrade. See THERMOMETER.

Centimetre, a unit of length, the one-hundredth part of the metre, and equal to 0.3937 of an inch. It is one of the fundamental units of the C.G.S. (centimeter, gram, second) system of absolute units, much used for scientific purposes. See METRIC SYSTEM; C.G.S.

Centipedes (*Chilopoda*), a division of the Myriopoda, air-breathing arthropods, which in many points resemble insects, but have no wings, and have numerous legs. The myriapods include the millipedes (q. v.) as well as the centipedes; but neither of these terms gives an accurate description of the number of legs. Centipedes may have more or many less than a hundred legs. They are carnivorous, poisonous, with flat bodies, many-jointed feelers, toothed cutting mandibles, and two pairs of maxillæ. The poisonous action is due to the two poison claws, which are placed in the head region, and, in the case of tropical specimens, are capable of inflicting a severe and perhaps fatal bite.

Centipedes are darkness-loving animals, nocturnal in their food hunting, lurking under stones or among rotten wood and the like during the day. Moving actively about at nights, feeling their way by means of their antennæ, which function as a blind man's staff, they light upon insects, worms, and other small animals, which they seize and kill with their poison-bearing appendages. Some forms can run with some rapidity, and wriggle about in curious serpent-like fashion.

Centipedes are usually divided into four classes, known as Scutigeridæ, Lithobiidæ, Scolopendridæ, and Geophilidæ. The typical genus is *Geophilus*, found under stones and decaying wood in both America and Europe. *Scolopendra gigantea* is the Giant Centipede, found throughout tropical America. See MYRIOPODA.

Centlivre, SUSANNAH (1667–1723), English actress and dramatist, was the daughter of a Lincolnshire gentleman named Freeman. Her first drama, *The Perjured Husband*, was produced at Bath in 1700. She wrote eighteen other plays, of which the best known are *Love at a Venture*, *The Gamester*, *The Busybody*, *The Wonder*, and *A Bold Stroke for a Wife*. Her plays were collected in 1761; some of them still hold the stage, being interesting in plot and lively in dialogue.

Centner is, with metallurgists, a weight of 100 lbs. The German centner is 50 kilograms or 110¼ lbs. avoirdupois; the metric centner is 100 kilograms.

Cento (Lat. 'a patchwork garment'), a composition, generally poetical, composed of lines and phrases extracted from other works, and combined so as to convey a different meaning from the original—such, for example, as the *Cento Nuptialis* of Ausonius and the *Cento Virgilianus* of Proba Falconia, both constructed from Virgil. Thomas Watson's *Hecatompathia* (1582) contains a sonnet (No. 89) composed of 'sentences' from classical writers literally translated.

Cento, town and episcopal see, province Ferrara, Italy; 20 miles southwest of Ferrara, with which it is connected by canal. Rice and hemp are exported. Cento is the birthplace (1591) of the painter Il Guercino, who founded here an academy of painting. Pop. 25,000.

Central America, that portion of the American continent which lies between Mexico and South America and includes the states of Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama (qq. v.), and the colony of British Honduras (q. v.).

Physical Features.—As a geographical division, Central America extends from the isthmus of

Tehuantepec to that of Panama, or perhaps to the Atrato valley in Colombia; for until the Tertiary period this area was divided into an archipelago by straits. The Sierra Madre of Chiapas extends across Guatemala, the northernmost state, and attains a height of nearly 10,000 feet, and mountains continue southward into Nicaragua. Volcanic rocks are widely distributed, especially in Nicaragua, Northern Costa Rica, and near the Pacific coast, where they form a cordillera, and rise to considerable heights, such as Acatenango in Guatemala (12,800 feet), and Irazu (11,200 feet) in Costa Rica. South of the Reventazon and the Rio Grande the Talamanca range culminates in the Chiriqui Grande, at a height of more than 12,400 feet.

As the line of greatest elevation lies much nearer the Pacific coast than the Atlantic, the rivers on the former slope are short. On the eastern side are the Belize River (270 miles) in British Honduras; the Motagua (260 miles) in Guatemala; the Ulua and Patuca in Honduras; the Rio Grande and San Juan, and the San Carlos, a tributary of the latter, in Nicaragua; and the Sarapigui, in Costa Rica; some of which are navigable by steamers. Largest of all is the Usumacinta, which rises in the western part of Guatemala, forms part of the boundary between that republic and Mexico, and traverses the Mexican States of Chiapas and Tabasco. The Wanks, or Segovia, separates Honduras from Nicaragua.

Climate.—In the *tierra caliente*, the low coast lands, the mean yearly temperature is from 80° to 73° F.; in the *tierra templada*, between 2,000 and 5,000 feet above sea-level, from 73° to 63°; and above the latter frosts occur. The rainfall is particularly heavy on the Atlantic slope. In British Honduras over 71 inches fall in the year, and in Alta Verapaz, Guatemala, about 180 inches, while San Salvador has only 54 inches. Still more striking is the contrast between Greytown (244 inches) and Rivas (69 inches).

Flora and Fauna.—The flora is that of tropical America. The woods contain mahogany and cedar, logwood, Brazil wood, and other dyeing materials; bombax, cocoa palms, and mangroves; fibres, winter's bark, sarsaparilla, vanilla, india-rubber; orchids and other beautiful flowers.

The fauna is as varied as the flora, and includes the puma, jaguar, tapir, manatee, monkeys, vultures, and birds of gorgeous plumage. Of the birds, two hundred and sixty species are peculiar to Central America. Insects are numerous and troublesome.

Peoples.—The most important aborigines in Central America were the Maya Indians (see Maya-Quiche; Mayas), whose influence extended into the present country of Mexico. The chief site of the Maya civilization, which was perhaps almost as advanced as that of the Incas of Peru (q. v.), was the peninsula of Yucatan. At the opening of the sixteenth century the Maya organization had disintegrated, the language had become a group of related dialects, while scattered over the region inhabited by the Mayas were the ruins of towns which had been the ancient centres of their culture. During the sixteenth century emigration from Spain to Central America began, and after the establishment of the independence of Central America, Europeans from other states than Spain settled there, while to certain sections colored people from the West Indies emigrated. The blood of these different peoples has mingled in a varying degree. The aboriginal element is probably the strongest in Guatemala. The present population is estimated at between 5,000,000 and 6,000,000

Commerce and Industry.—All the republics of Central America, with the exception of Salvador, face both the Atlantic and the Pacific Oceans, the Atlantic side being especially bound to the United States by its transportation, trade, and financial interests. The United States is the chief buyer of Central American products and the principal source of supply of its imports, and American financial interests predominate in all the countries except British Honduras, where British capital is employed in the lumber industry, and in Guatemala, where German capital controls the coffee industry.

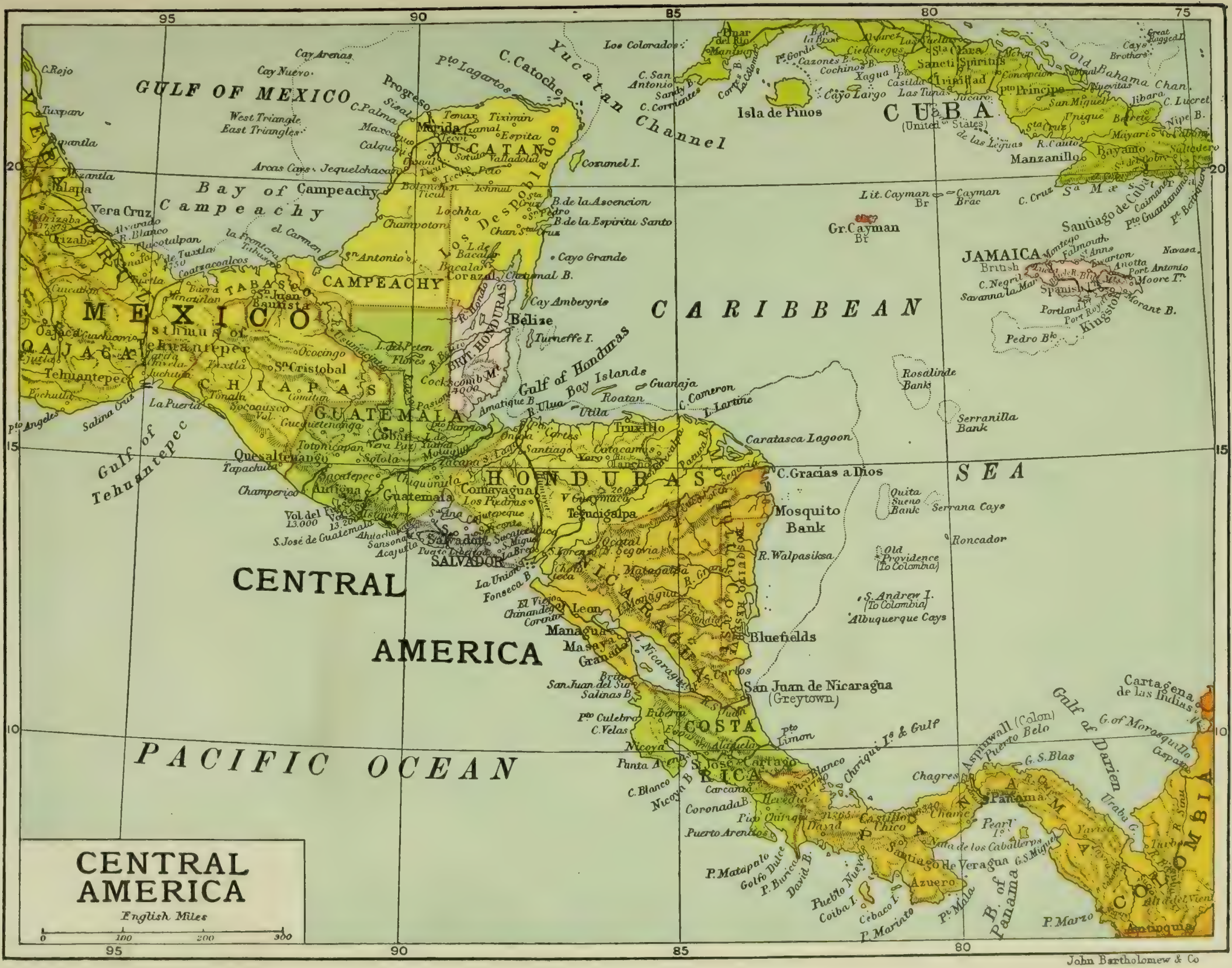
The exports of a tropical country are a fair index of its industrial life. Costa Rica and Honduras are banana states, Salvador and Guatemala coffee states, British Honduras a timber state, and Nicaragua a coffee and banana state. Other Central American exports include chicle, sugar in small quantities, hides, cocoanuts, rubber, balsam, and minerals. Except where foreign enterprise and capital have developed the countries, they are very backward, though they have great latent possibilities as a source of supply of tropical fruits and tropical woods.

Cotton goods constitute the first class of imports ranked according to value; while foodstuffs—notably flour, canned meats, salt pork, canned fish, butter and butter substitutes, and canned vegetables—form the second group of importance among the imports of practically every state—and this in spite of the fact that the country is fully capable of producing its own food supply. Central America depends upon the United States and Europe, also, for practically all manufactured goods, though small shops manufacture shoes, furniture, hats, cigars, pottery, etc.

Modern methods of land transport are almost unknown except in ambitious paper projects. Here and there short railway lines serve local developments, such as banana plantations, but these are due almost entirely to foreign enterprise and capital. Wagon roads scarcely exist, and recourse is had to mule trains which move over difficult trails. Without traffic facilities much of the territory must continue to remain in an undeveloped state.

History and Government.—Central America was discovered by Columbus on his fourth voyage in 1502, was completely under Spanish control by 1524–5, and, with the exception of a region upon the Gulf of Belize of which the British secured control and which they still retain under the name of British Honduras, it remained in Spain's possession until 1821. In the latter part of that year, the five provinces of Guatemala, Nicaragua, Honduras, Costa Rica, and Salvador declared their intention to reject Spanish rule and to associate themselves with independent Mexico, and in 1824 a constituent assembly promulgated a constitution for the United Provinces of Central America, modelled upon the constitution of the United States. After a turbulent history of fifteen years, this confederation was dissolved, and the five sections of Central America framed distinct constitutions. In 1903 Panama declared its independence of Colombia and made the sixth of the present republics. In 1907, at the instance of the Presidents of the United States and Mexico, a conference of the Central American states was held at which various agreements were drawn up concerning the mutual relations between these states. Among these agreements was a treaty which provided for the adjudication of their disputes by a Central American court of justice.

Four of the existing constitutions of the Central American states have a family resemblance. The constitutions of Costa Rica, Salvador, Guatemala, and Honduras, framed from 1871 to 1904, make provision for executive,



CENTRAL AMERICA

English Miles

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judicial, and legislative departments. Each of these states has an elective president, whose substitute is a vice president, or a person designated by congress, and the legislature of each is unicameral. The four constitutions specifically provide for a cabinet, the members of which may attend the sessions of congress, and the final judicial authority is a supreme court. Salvador, Guatemala, and Honduras designate their administrative divisions as departments, while Costa Rica designates hers as provinces. The government of Nicaragua differs from the other Central American states in that the constitution, adopted in 1913, vests the legislative authority in a bicameral legislature composed of a chamber of deputies and a senate. Panama has a unicameral Chamber of Deputies and a president elected for four years. Despite the republican form of government, the presidents of the Central American republics have upon many occasions exercised autocratic power.

For a more detailed description of the various republics, see the separate articles on GUATEMALA; SALVADOR; HONDURAS; NICARAGUA; COSTA RICA; PANAMA.

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Central Asia, that portion of Asiatic Russia lying to the southwest of Siberia and comprising Russian Turkestan, Transcaspia, and the Kirghiz Steppe territory. It includes the provinces of Akmolinsk, Fergana, Samarkand, Semipalatinsk, Semiryechensk, Syr Daria, Turgai, Transcaspia, and Uralsk (qq. v.), and covers a total area, exclusive of the Caspian Sea and the Sea of Aral, of 1,325,500 square miles. On the west it is bounded by the Caspian Sea and European Russia, on the east and southeast by mountain ranges which separate it from Eastern Turkestan and Mongolia, and on the south by Afghanistan and Persia.

The greater part of this area lies within the Aral-Caspian basin, while highlands in the east and south divide the country almost equally with lowlands in the west and north. The latter fall in the neighborhood of the Caspian Sea below sea level, but a large proportion of the former rise to over 5,000 feet while some reach an altitude of more than 20,000 feet. Besides the Pamir plateau, itself a western outpost and knot of the Tibetan highland, Russian Central Asia includes the western Tian-Shan and its outliers, the Alai and Trans-Alai, the Alexander Mountains, the Tarbagatai Mountains, the Zungarian and Trans-Ilian Alatau, the Mugojar ridge, forming a continuation of the Urals, and some lesser ranges. Of rivers it has the Oxus or Amu Daria, the Jaxartes or Syr Daria, Zerafshan, and Murghab. The once great lakes, as those of Balkhash and Issik-kul (qq. v.), and the Sea of Aral, have shrunk in their dimensions, while others have completely disappeared, and much of the country in the mountains, as well as in the plains, is of the steppe character, but sparsely clothed with vegetation.

The climate shows a remarkable uniformity for so large an area. The average summer temperature ranges between 68° and 77° F., and the winter temperature from 50° to 23° F.

The population is composed, linguistically, of various races of the Turki stock, of Persians and other Iranians, of Galcha mountaineers, and of Russian Slavs (immigrants of recent date). Among the 5,500,000 of Turki peoples, Uzbegs of Bokhara, Khiva, and Khokand account for more than two-fifths, Kirghiz (of various denominations) for almost three-fifths; the remaining half-million or more are Turcomans. The Persians and Tajiks of Iranian stock, chiefly inhabiting the towns, and forming the mercantile and settled classes, number somewhat over a million. The Galcha highlanders probably do not exceed 300,000. Theoretically the native peoples are Mohammedans, but great religious laxity prevails.

History. — The earliest relations of Russia with Central Asia were with the khanate of Khiva. At the beginning of the seventeenth century the Tsar Michael Feodorovitch held communications with the khan relative to Cossack raids in Khivan territory, and in 1717 Peter the Great despatched a disastrous expedition to Khiva in a futile attempt to secure the submission of the khan as a vassal of Russia. At about the same time Russian dominion was successfully extended up the middle Irtish by an expedition which founded Omsk, and in 1718 built the first fortress at Semipalatinsk destined soon to become an important centre of trade with China and Central Asia. A fortification was established at Kansk two years later, and a line of fortified posts, constituting the southern border of Russian territory in Asia for more than a century, was soon constructed as far west as Orenburg. In 1732 the Kirghiz of the Middle and Little Hordes, who ranged over the western steppes, offered their submission to the Empress Anne; in 1803 the tribes of the Mangishlak peninsula, on the eastern side of the Caspian Sea, became Russian vassals, and in 1842 a treaty of friendship and alliance was concluded with the khan of Khiva. In 1831 a fortified settlement was established at Sergiopol, about 200 miles southwest of Semipalatinsk, and in 1844 the last of the Kirghiz Tartars submitted peacefully to Russian rule.

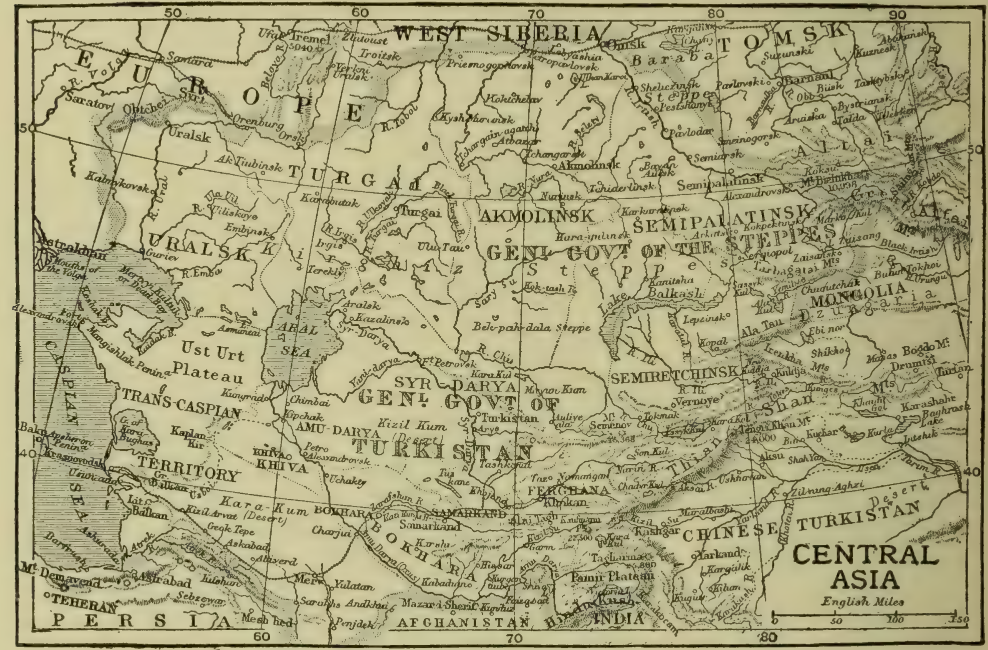
In 1847 a Russian fort was erected at the mouth of the Syr Daria, and in 1853 General Perovski pushed 280 miles up the river to the Khokand stronghold of Ak Mechet, which he stormed successfully and renamed Fort Perovski. The following year a Russian expedition penetrated the valley of the Ili, and a fort was built at Verni between Lakes Balkhash and Issik-kul, leaving, however, a gap of 500 miles between it and the last Russian outpost on the Syr Daria. To bridge this gap in 1864 a simultaneous advance was undertaken from the Ili basin on Aulie Ata, and from a base on the Syr Daria on Hazret-i-Turkestan. After successful attacks on these objectives, the two forces combined and stormed Chimkend, commanding, with Tashkend, the basin of the Middle Syr Daria. Tashkend was taken the following year, and Turkestan was constituted a frontier district with that city as its capital.

The Asiatics, however, were by no means crushed. Bokhara now joined Khokand, and more than 40,000 Uzbegs advanced on Tashkend; but were utterly routed by the Russians on May 20, 1866, at Irjai, close to the south bend of the Syr Daria. The capture of Khojend (June 6, 1866) and the invasion of Bokhara quickly followed, and on July 11, 1887, by imperial ukase, Turkestan, including all the conquests in Semiryechensk and the Syr Daria basin, was made a general governorship under Kauffmann, with its capital at Tashkend. The native spirit, however, was still unbroken, and on May 12, 1868, the united forces of Bokhara, Khiva, and Khokand, massed for attack on the left bank of the Zarafshan, were again routed by

Kauffmann 15 miles outside Samarkand. The city itself surrendered the following day (May 13), the emir of Bokhara's submission followed, and the province of Samarkand was incorporated with Turkestan.

The next stages of Russian conquest in Central Asia were marked by the conquest of Khiva which acknowledged the suzerainty of Russia in March, 1873; the conquest of Khokand (1876), which was annexed as a province of Turkestan under its ancient name Fergana in 1876; the conquest of the Turcoman country (1881–4), the occupation of the land between Merv and Penjdeh (1884–5), the delimitation of the Russo-Afghan and Russo-Persian frontiers from the Caspian Sea to the Chinese border (1885–95), and the occupation and delimitation of the Pamir (1890–5). Skobeleff effected the conquest of the Turcomans by storming the forts of Geok Tepe and Yangikala Dangil Tepe, the chief Turcoman strongholds, Jan. 1–24, 1881, and the submission of Merv (1884) completed the victory. The occupation of Sarakhs, Pul-i-khatun, the Zulfiker pass, and Pul-i-khisti followed in rapid succession (down to February, 1885); and on March 30, 1885, the Afghans were routed and driven out of the Penjdeh oasis. War with Britain almost resulted from this last action; but ultimately a frontier was peacefully agreed upon, Russia obtaining the right bank of the Hari Rud as far as the Zu-l-Fikar Pass and the valleys of the Badghis south of and including the Penjdeh oasis. On July 12, 1892, the Afghans were routed at Somatash; the Russian outpost of Fort Pamir (Pamirski Post) was established (1893) in the heart of the mountain region; and on March 11, 1895, the treaty was signed by which all the Pamir north of the branch of the Oxus flowing from Sari-kul, or Lake Victoria, and a line drawn thence eastward to the Chinese frontier passed into the hands of Russia.

See BOKHARA; KHIVA; TRANS-CASPIAN RAILWAY; TRANS-CASPIAN TERRITORY; TURKESTAN, RUSSIAN. Consult Lord Curzon's *Russia in Central Asia;* A. Krausse's *Russia in Asia;* F. H. Skrine and E. D. Ross' *The Heart of Asia;* H. Stumm's *Russia in Central Asia* (Eng. trans.); G. F. Wright's *Asiatic Russia* (2 vols.); S. Graham's *Through Russian Central Asia* (1916).

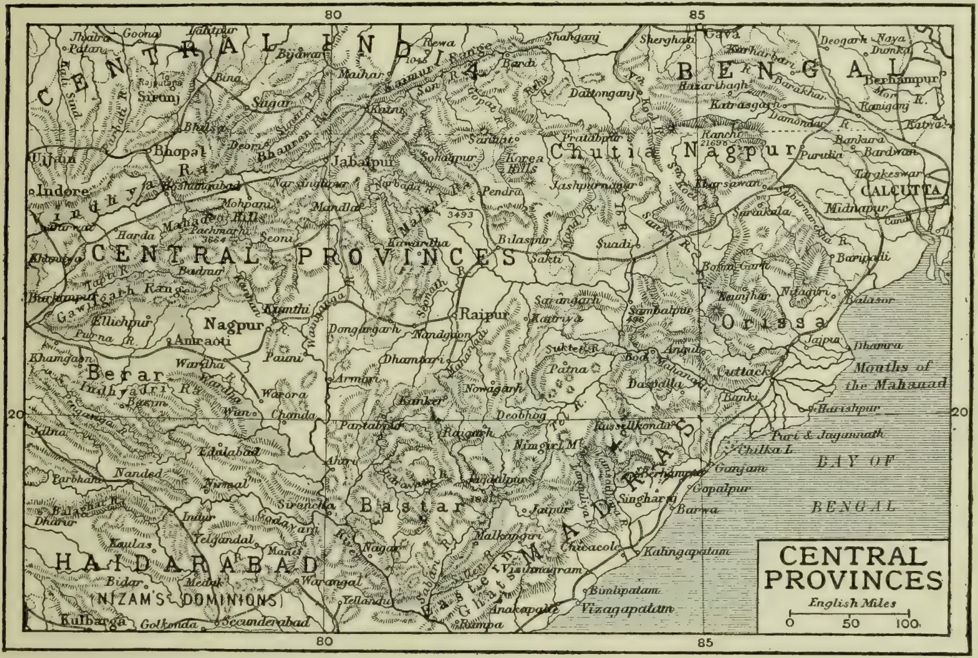


Central City, town, Kentucky, Muhlenberg county, on the Green River, and the Illinois Central, the Louisville and Nashville, and the Kentucky Midland Railroads; 35 miles northwest of Bowling Green. It is the centre of the coal-mining region of Western Kentucky. It has railway repair shops. Pop. (1910) 2,545; (1920) 3,108.

Central City, city, Nebraska, county seat of Merrick county, on the Platte River, and the Union Pacific and the Chicago, Burlington and Quincy Railroads; 115 miles west of Omaha. Nebraska Central College is located here. Central City is a shipping point for live-stock. Pop. (1910) 2,428; (1920) 2,410.

Central Falls, city, Rhode Island, Providence county, on the Blackstone River and the New York, New Haven and Hartford Railroad; 6 miles north of Providence. It has a public library and city parks. Manufactures include machinery, cotton, woollen and silk goods, haircloth, glass, and leather. According to the Federal Census for 1919, industrial establishments number 67, products valued at $22,628,477. Originally part of Lincoln, Central Falls was separately incorporated in 1895. Pop. (1900), 18,167; (1910) 22,754; (1920) 24,174.

Central Forces. A force acting on a given body is said to be central when it always acts toward a fixed point or centre. The importance of this group of dynamical problems arises from the fact, established by Kepler and Newton, that the bodies constituting our solar system move under the influence of gravitational forces which pass very nearly through a definite point—the centre for the planets being approximately the centre of the sun, and the centre for each group of satellites being approximately the centre of the corresponding planet. It is found that calculations based on the assumption that the forces acting on the planets are towards one centre lead to results closely concordant with observation. Another simple example of an approximately central force is the case of a heavy body attached to one extremity of a string and set in rapid revolution round the other extremity, which is kept fixed. If we leave out of account for the moment the action of the body's own weight, we may regard it as acted upon by the tension of the string directed towards the fixed end. When a force acts upon a body, it causes acceleration, involving both change of speed and change of direction of motion; and in the case of a central force this acceleration must take place towards the centre. Hence there is no acceleration at right angles to the line joining the centre of force and the position occupied for the moment by the body. This condition leads, by simple dynamical considerations, to the statement of what is known as Kepler's law of equable description of areas. If we measure the area passed over by the line joining the centre of force and the body as the latter describes its path, we find that in all positions this area has the same value during the same interval of time. This law of planetary motion, established by Kepler after laborious calculations, led at once, according to Newton's principles of dynamics, to the conclusion that each planet was acted upon by a central force directed towards the sun's centre. The reason why the forces dominating the motions of the planets and satellites of our solar system may be treated as central forces is that the mass of the sun is very great compared with the combined mass of the planets, and that each planet is much more massive than its attendant moons.



Centralia, city, Marion co., Ill., 60 m. E. by S. of St. Louis, a junction of three branches of the Ill. Cent., and on the Jacksonville and St. Louis, the Ill. S., and the S. R. Rs. Machine and repair shops of the Illinois Central R. R. are located here, and there are coal and iron mines. It is in the centre of a fruit-growing district, especially adapted to apples and strawberries. Pop. (1910) 9,680.

Central India is the official name applied to a group of feudatory or native states occupying that part of India N. of the Central Provinces, W. of Bengal, and S. of Rajputana and the United Provinces. The district is divided into two sections—*viz.* Bundelkhand in the W. and Baghelkhand in the E. The most important states are Bhopal, Gwalior, Indore, and Rewa. Area, 78,772 sq.m. Pop. (1901) 8,628,781.

Centralization, a term used in practical politics, as well as in political science, to indicate the tendency towards concentration of administrative power in the hands of the state or central authority, which tendency has steadily become more noteworthy as the conception of the function of the state has widened. The supremacy of the authority of the modern state is unquestioned; all rival local authorities have disappeared.

In the United States the term is also applied to the tendency to concentrate legislative power in the Federal Government with the consequent weakening of the position of the states. This tendency is especially apparent in matters relating to commerce. In the states legislative functions were originally extremely centralized, the local bodies having practically no independent legislative sphere. The administration, on the other hand, was extremely decentralized. In the last half century central control of local administration has been introduced in many states, particularly in the North and West. Thus the control of the educational system, originally purely a local matter, has in many states been vested in a state board. State control of the administration of charities is another indication of the same tendency. Further, the administrative functions which have developed recently, as the administration of labor laws, of laws regulating state commerce, etc., have naturally been retained by the state. At present there is a widespread movement in favor of central supervision of local accounts. The movement in favor of municipal home rule, on the other hand, is part of a tendency towards decentralization of legislation.

Central Provinces, lying in the centre of the peninsula of India, are encircled on three sides by states under native rule. Their N. and N.E. limits are bordered by the large feudatories under the Central Indian Political Agency, and the S.W. by Berar and the dominions of the Nizam of Haiderabad. On the S.E., the N. districts of the Madras Presidency separate the Central Provinces from the Bay of Bengal. The Chota Nagpur division of Bengal touches the N.E. angle. Area, 86,459 sq. m. The principal rivers are the Narbada, which traverses the N. districts from E. to W.; and on the W. side the Tapti, the Wardha, and the Waingunga—the first running W., the two others taking a S. direction. The S. extremity of the country is covered with wild, impenetrable jungle. The forest area is over 19,000 sq. m. Coal is found in the Nagpur division, the output in 1900 aggregating 131,584 tons. A prolific soil yields a rich harvest—cotton, tilly-seed, wheat, rice, grain, pulse, and linseed being the chief products. Cotton factories flourish in the Nagpur division. The Great Indian Peninsula Ry. skirts the N.E. and S.E. borders, and the Bengal-Nagpur line, running from W. to E., bisects the province. The province comprises four divisions—Narbada, Jabalpur, Nagpur, and Chattisgarh. The native states, of which Bastar is the largest, contain an area of 29,435 sq. m. and a pop. of 1,996,383. The bulk of the population is Hindu; there is a large number of Gonds (aborigines), and a fair percentage of Mohammedans. Successive seasons of drought and famine have greatly retarded the development of the country. Pop. (1901) 9,876,646 (4,855,984 males and 5,020,662 females).

Central University of Kentucky. A Presbyterian institution of learning at Danville, Ky., founded as Centre College in 1819. It comprises Centre College as its classical, scientific, and literary department, the Kentucky Theological Seminary at Louisville, the Hospital College of Medicine at Louisville, and the Louisville College of Dentistry. In 1905 the university had 1,168 students, 109 instructors, a library of 21,000 volumes, $500,000 in productive funds, and an income of $31,000.

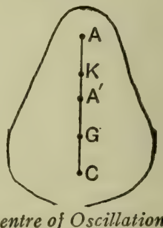
Centre, CANAL DU, canal (constructed 1781–93), dep. Saône-et-Loire, France, joining the Saône and Loire. It begins at Châlon-sur-Saône, and extends to Digoin, on the Loire, a distance of 75 m.

Centreboard, shifting or drop keel used in small boats and racing craft, especially yachts and cat-boats. The centreboard passes through a slot in the bottom of the boat, and swings on a pivot, so that it can be hauled into its case or let down at will. Its object is to prevent a boat making leeway by offering great lateral resistance to the water. Folding centreboards are also used for small boats and canoes. Lee boards are a primitive device for adding keel depth to a boat, but they are only adapted for vessels with wall sides.

Centre of Gravity, also known as the centre of mass or centre of inertia, is that point in a body through which the weight of the body acts, and is such that if it is fixed the body will balance about it in any position. The conception is a simple one in the case of a body of invariable shape, but it may be extended by suitable definition to the case of any system of bodies under any conditions of mutual freedom or constraint. When the body is of a simple geometrical shape and of the same material throughout, there is no difficulty in calculating the position of the centre of gravity; and when it is of irregular shape, the position of the centre of gravity may be roughly estimated by suspending the body first by one point, and then by a second, and noting the position in the body of the vertical line through each point when it is the point of suspension: the meeting-point of these two lines is the centre of gravity. The centre of gravity of a body, or combination of bodies, has certain important dynamical properties. If a body be struck by a blow in a direction through the centre of gravity, the body will move away without rotation; but if the direction of the blow is not through the centre of gravity, the body will move off with combined translation and rotation.

In a strictly scientific sense, the term centre of gravity should be applied to that point (if it exist) towards which the gravitation attraction of the body on other bodies acts. Thus, two uniform spheres attract one another as if each were condensed in its centre. Their centres are, therefore, real centres of gravity. But cubes will not attract one another through definite fixed points within them. The cube of uniform material has not a true centre of gravity, but it has a true centre of mass. For the latter is obtained by a definite process of averaging which leads always to a definite result, whatever the distribution of matter. In the case of bodies of finite size near the earth's surface, the particles composing the body are acted on by parallel forces due to the earth's attraction; and the process of finding the centre of mass is identical with the process of finding the resultant of these parallel forces. Hence such bodies are really acted on by a single force passing through the centre of mass, which is also a centre of gravity. Indeed, when a true centre of gravity does exist, it is coincident with the centre of mass; but although all distributions of matter have a centre of mass, comparatively few have a real centre of gravity. Bodies which have true centre of gravity, such as uniform spheres and other forms with particular distributions of density, are called centrobaric bodies.

The centre of gravity of a body, or system of bodies, tends to come to the lowest possible position consistent with the conditions of constraint imposed upon it. For example, let several balls of various sizes and weights be placed in a bowl. After rolling about for a short time, they will come to rest in such a position that the centre of gravity of the whole will come to its lowest possible position. Any slight displacement of the system of balls will cause the centre of gravity to rise. Work must be done against the earth's attraction in effecting this displacement, and the work done is measured by the whole weight multiplied by the height through which the centre of gravity is raised. In other words, we increase the potential energy of the system. When the centre of gravity reaches its lowest possible position consistent with the conditions, the potential energy has its minimum value. This particular case is an example of a general principle, that a material system is in stable equilibrium when the potential energy has a minimum value—*i.e.* such a value that any displacement causes an increase.

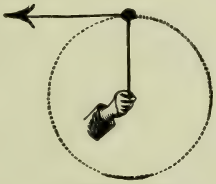


Centre of Oscillation.

Centre of Oscillation. Let a body with centres of mass oscillate through small angles about a horizontal axis through any chosen point A. If A be taken very close to G, the rate of oscillation will be slow, because of the small leverage AG; and if A be taken very far away, again the rate of oscillation will be slow. There will evidently be some particular position for A—say K—which will give the most rapid oscillation. For every position of A further removed from G than this critical position K there will be a second position A′, nearer to G, for which $GA' . GA = GK^2$, and about which the body will oscillate in the same period. Not only so, but if we take C in AG produced such that $GC = GA'$, and set the body oscillating about an axis through C, exactly the same period of oscillation is obtained. This corresponding point C, situated in AG produced, is called the centre of oscillation relatively to A. If C is made the centre of suspension, A becomes the centre of oscillation. It can be shown that the body will oscillate in the same time as a simple pendulum of length AC.

Centre of Percussion. If a body be free to rotate about a given axis, and if it be struck in such a way that the blow does not produce pressure on the axis, then the direction of the blow passes through a point in the plane containing the axis and the centre of mass, which is known as the centre of percussion. This explains the fact that if some object be struck by a stick held in the hand a jar will be felt, unless the blow be made at the centre of percussion of the stick with regard to the hand. The centre of percussion with respect to any axis is the same point as the centre of oscillation.

Centrifugal Force, a term in dynamics somewhat misleading in its etymological meaning (L. *centrum*, 'the centre'; *fugere*, 'to flee'), but of great importance in its proper significance. To compel a body to move in a curve a force must be applied at right angles to the directions in which the body is moving. The sharper the curvature of the path in which the body is to move, the greater must be the force required; and the more rapid the motion of the body, the greater must be the deflecting force to make the body move in a path of given curvature. A stone whirled round at the end of a string is pulled in constantly by the tension of the string. Now, according to Newton's third law of motion, which is simply a concise expression of experience, to every action there is an equal and opposite reaction. The taut string pulls upon the fixed end in the direction of the stone: in this case the reaction is particularly evident, and it is the recognition of the reaction which has suggested the idea of a centre-flying force. No doubt, before the foundations of dynamics were securely laid by Newton, the idea that a stone whirling round in a sling had an outward tendency was universally prevalent. As a matter of fact, the stone leaves the sling in the direction in which it was moving at the instant it got free. What we now understand by the term centrifugal force is the reaction to the force which is required to make the moving body describe a curved path. This is sometimes called the centripetal force (L. *centrum*, 'the centre'; and *petere* 'to seek'). Its measure is the same as that of the force required to cause this curvilinear motion—*viz.* the product of the square of the speed into the curvature of the path.



Centrifugal Force.

The principle of centrifugal force is used in many forms of mechanism, such as governors on steam-engines, rotary drying machines, cream separators, and centrifugal machines of various kinds. In drying machines, the wet material is placed in a rotating cylinder with perforated sides, through which the liquid escapes in virtue of centrifugal force. The action of the cream separator depends upon the fact that the cream is lighter, bulk for bulk, than the milk. Hence, for a given rate of rotation in a closed cylinder, the centrifugal tendency of the cream will be less. It will tend to accumulate in the centre, while the denser skim milk will be driven out to the sides.

Centripetal Force. See CENTRIFUGAL FORCE.

Centumviri, in ancient Rome a court of plebeian judges whose numbers varied from 100 to 180. They sat sometimes in sections (*consilia*), and sometimes as a body under the presidency of the prætor. Their jurisdiction originally extended to questions of status, quiritian ownership and succession, but latterly was confined largely to questions of succession. A spear, the special symbol of quiritian ownership, was erected in front of their court.

Centurion, a Roman officer of foot. The three principal divisions of the legion, the *principes*, *hastati*, and *triarii*, each elected twenty centurions, of whom two were appointed to each of the thirty companies of foot into which the legion was divided. The first centurion chosen was a member of the council of war.

Centuripe, also until recently CENTORBE, tn., Sicily, prov. Catania, stands on the steep ridge (2,305 ft.) which parts the Simeto from the Salso, 28 m. by rail N.W. of Catania. It was one of the most prosperous of Sicilian towns under the Romans, but was destroyed by the Emperor Frederick II. in 1233. It has sulphur mines. Pop. (1901) 11,187.

Century Magazine, THE, an American monthly magazine, published in New York city, has existed under its present name since 1881. It was previously known as *Scribner's Magazine.* It has had many eminent contributors and has been a leader in the art of wood-engraving and color reproductions, and its illustrations have always been remarkable for their character and quality.

Ceorl. Originally the word meant a freeman who was not a thegn or of noble birth. The ceorl occupied an intermediate position between the thegn and the serf, and tended to be absorbed into one or other of these classes, generally into the lower. By the time of the Norman Conquest the progress of Anglo-Saxon economy towards feudalism had practically, except in the Eastern and Danish counties, caused the ceorl's disappearance, and the villein, whose position was also ambiguous, takes his place in the records.

Ceos, now ZEA or TZIA, an island in the Ægean Sea, one of the Cyclades, distinguished for its fertility and excellent climate.

Cephalaspis, one of the most remarkable of the many extraordinary fishes of the Old Red Sandstone. In Scotland several species have long been known from the sandstones of Arbroath. It has been recently found also near Oban and in Caithness. It occurs in Wales, Spitzbergen, and the Lower Devonian rocks of Gaspé, Canada. Its appearance must have been most uncouth, as it had a large, somewhat flattened head, covered by a bony shield, semicircular in outline, with the outer corners prolonged backwards into spinous prominences. The eyes were almost in the centre of this shield, placed close together, and quite small. The body was comparatively slender, and covered with elongated narrow scales in three rows on each side. The tail was of the heterocercal type, and just in front of it there was a small dorsal fin. The internal skeleton appears to have been cartilaginous, and has not been preserved. Its systematic position is still a matter of controversy. See Dean's *Fishes, Living and Fossil* (1895); Ray Lankester's *Monograph of the Fishes of the Old Red Sandstone of Britain* (1868).

Cephalhæmatoma, a swelling caused by the effusion of blood under the pericranium of a newborn infant, due to pressure during birth. Sometimes, but rarely, the effusion takes place under the bone. The cephalhæmatoma is felt as an elastic, fluctuating, non-pulsating swelling, with a sharp edge of bone circumscribing it. Usually it becomes absorbed, and therefore should not be interfered with unless suppuration occurs. In the rare cases where cephalhæmatoma occurs under the bone, there is danger through pressure on the brain.

Cephalic Index. See ANTHROPOLOGY.

Cephalochorda, a name applied to a class of vertebrates which includes only Amphioxus, the lancelet, and its near allies. See AMPHIOXUS.

Cephalodynia, a term applied to pains in the head, and in particular to those of a rheumatic nature.

Cephalœdium, Italy. See CEFALU.

Cephalonia, KEPHALONIA, or KEPHALLENIA, the Samos (*Samē*) of the *Odyssey*, is the largest of the seven Ionian Isles lying to the W. of the mainland of Greece, opposite the entrance to the Gulf of Lepanto. Its coast-line is deeply indented, and its surface is mountainous, the culminating point being Ainos (5,315 ft.), once crowned by a Temple of Jupiter. The vine and currant are cultivated largely, and wine, wheat, olive oil, and fruit are exported. Chief tn. Argostoli. Area, 302 sq. m. Pop. (1896) 83,363.

Cephalopoda, or CUTTLES, the highest class of Mollusca, including those forms in which the foot has grown up around the head and is split up into arms. Except in the pearly nautilus and the female argonaut, the living forms are without shells, but many retain in the 'cuttle-bone' what is believed to be the last remnant of the shell. In the extinct Ammonites the shell was large, and, as in the living nautilus, divided into chambers by septa. Its reduction in living cuttles is probably associated with increased rapidity of locomotion, the living forms being actively predaceous, swift-swimming animals entirely confined to the sea. Many cuttles creep about on the sea-bottom by means of their sucker-bearing arms, but all are capable of jerking themselves swiftly backwards by means of the siphon or funnel. This is a tube (incomplete in Nautilus) communicating with the mantle cavity, by means of which water can be forcibly expelled from the cavity, the result being to drive the animal backwards. Except in Nautilus, there is an ink-bag, the contents of which the animals discharge into the surrounding water when alarmed, thus producing a cloud, under cover of which they may escape. Within the mantle-cavity lie the gills, two in number in all, save the nautilus, which has four. The mouth contains a strong, parrot-like beak, as well as a tooth-ribbon (radula). The nervous system is unusually well developed. Living cuttles may be classified as follows:—(1) Dibranchiata, including all living forms, save the pearly nautilus; divided into (*a*) those with eight arms, like Octopus (Octopoda), and (*b*) those with ten arms, like Sepia, Loligo, Spirula (Decapoda). (2) Tetrabranchiata, including the pearly nautilus, and many extinct forms. These extinct forms, known as *Ammonites*, were very numerous in the Mesozoic era of geologic time, and were so nearly confined to it that their remains form the most characteristic fossil type of that era. They developed rapidly in the Jurassic period especially, the succession of species exhibiting greater and greater complexity of suture or convolution of the partitions separating the series of chambers. The animal occupied only the outer chamber, each successive one representing stages of growth and abandonment. Minute subdivision of rock strata is sometimes possible by the aid of these forms. The later forms are less closely coiled and some related genera are straight. They declined rapidly in the Cretaceous time and became extinct at its close. Ammonites exhibit great variety of minor feature and size. Many are ornamented with ribs or knobs, and they are known to range from a fraction of an inch to 10 ft. in diameter. No more beautiful, interesting, and extensive series of fossil forms of any type of animals is known. See Zittel's *Paleontology* (1900), and other text-books.

Ammonite.

Cepheus. (1.) In Greek mythology, King of Ethiopia, husband of Cassiopeia, and father of Andromeda. (2.) An ancient Greek constellation, belonging to the legendary group connected with the fable of Andromeda. Its principal star, which is of 2.6 magnitude, will mark the pole some 5,600 years hence.

Cephissus. (1.) A river in ancient Greece, flowing partly in Phocis, partly in Bœotia, to Lake Copais. It is now called the Mavronero. (2.) The largest river (modern name, Sarantaporos) in Attica, rising on the W. of Mt. Pentelicon, and entering the sea near the bay of Phaleron.

Cepit (*'He took'*). Used in civil practice it is a form of replevin. In criminal practice it is a technical word employed in indictments for larceny.

Ceram, or SIRANG, an isl. of the Dutch E. Indies, one of the Moluccas; lies between New Guinea and Celebes. It is mountainous in the W. (8,000 ft.), with low plains in the S., and is connected by a very narrow isthmus with a smaller peninsula on the W. It produces sago, cloves, cocoanuts, rice, cocoa, and timber. Area, about 7,000 sq. m. Pop. estimated at 70,000 to 100,000.

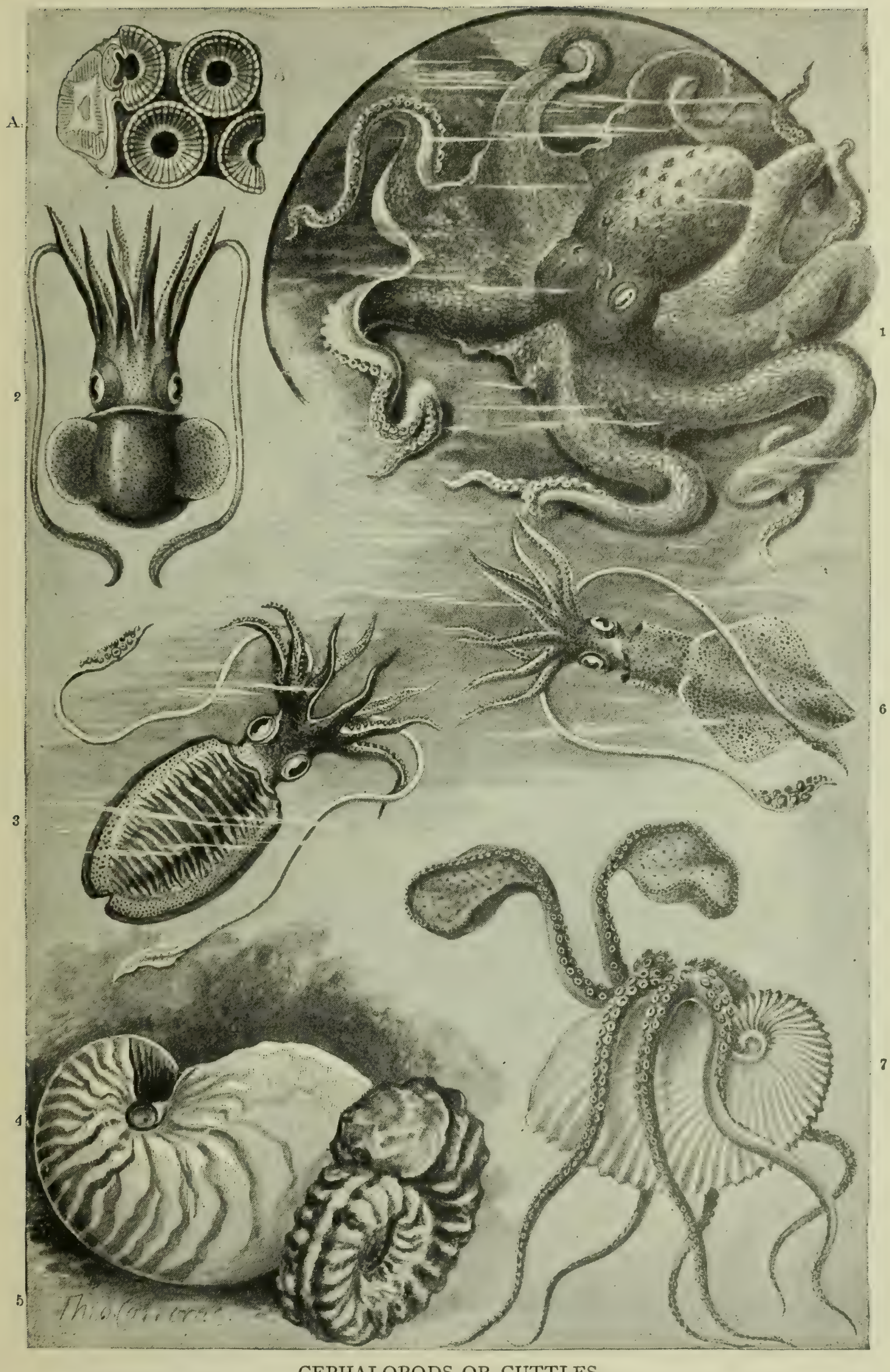
Ceramics. See POTTERY.

Cerargyrite, horn silver, or silver chloride, AgCl, is a silver ore of considerable importance in certain mines. When pure it is transparent and resinous and may carry 75 per cent. of the metal. The largest masses are brought from Peru, Chili, and Mexico, where it occurs with native silver. Many silver mines of the United States produce this mineral, in Colo., Idaho, Nev., Utah, and others.

Cerastes, the genus to which the horned viper (*C. cornutus*) belongs. It occurs in N.E. Africa, extending into Palestine and Arabia. Another species (*C. vipera*) is believed to have been Cleopatra's 'asp.' Both are poisonous snakes, belonging to the family Viperidæ.

Cerasus, a colony founded from Sinope; it lay on the N. coast of Pontus, on the S. shore of the Black Sea. From this place the cherry, as well as its name, was introduced into Europe. It fell into decay after the foundation of another city, also called Cerasus, but more commonly Pharnacia.

Ceratodus, a name applied to a genus of fishes which includes many fossil forms, and one (or two) living species (mud-fish) from Queensland rivers. The members of the genus belong to the Dipnoi, or double-breathers; and the living Ceratodus uses both its gills



CEPHALOPODS OR CUTTLES.

1. Common Mediterranean Octopus or 'poulpe' (*Octopus vulgaris*): A, suckers. 2. A Cuttle (*Rossia macrosoma*). 3. The Calamary (*Sepia officinalis*). 4. Shell of Pearly Nautilus (*Nautilus pompilius*). 5. An Ammonite (*Ammonites obtusus*). 6. Common Atlantic Squid (*Loligo vulgaris*). 7. Paper Nautilus (*Argonauta Argo*).

and its lungs, or swim-bladder, as breathing organs. The latter is apparently functional chiefly during those periods of the year when the water becomes foul, owing to decaying vegetable matter, or is laden with sand. The body in Ceratodus is elongated and compressed, with a continuous vertical fin, and the paired fins are paddle-shaped. There are no external gills. The animal may reach a length of six feet.

Ceraunii, the Ceraunian Mountains. See ACROCERAUNIAN.

Cerberus, the hound that guarded the entrance to Hades, was (according to Hesiod) the offspring of Typhoeus and Echidna. He is usually represented with three heads, but sometimes with fifty or even a hundred. The story of how Hercules mastered him and brought him up to earth is told by Homer, Hesiod, and Virgil.

Cercaria, a stage in the life-history of the liver-fluke (*Distomum*). The cercaria is really the young fluke. It is furnished with a tail, by means of which it wriggles out of the body of its host, the water-snail, swims through the water, and becomes encysted on a blade of grass, losing the tail in the process. If eaten by a sheep, it becomes an adult liver-fluke. See LIVER-FLUKE.

Cercyon, son of Poseidon, and King of Eleusis; a cruel tyrant, who murdered all strangers by wrestling with them, until Theseus defeated him and slew him.

Cerdic (d. 534?), King of the West Saxons, the ancestor of all our kings except Canute, Hardicanute, the two Harolds, and William the Conqueror. He founded one of the greater Teutonic kingdoms in Britain, is said to have been ninth in descent from Woden, and to have landed probably in Hampshire (495). After allying himself with Aese and Aella (Ella), he inflicted severe defeats on the Britons, and in 519, with Cymric, he established the kingdom of the West Saxons. He conquered the Isle of Wight in 530. See *Anglo-Saxon Chronicle*.

Cereals include all grasses producing mealy seeds used for food. The term denotes the entire plant and also the grain by itself. The word cereals is derived from cerealia, meaning the offerings, consisting largely of wheat and barley, which were made to the Roman goddess Ceres, the mother of Proserpine. The principal cereal crops of the world, including corn, wheat, oats, barley, rye, and rice, have always and everywhere been cultivated to a much larger extent than other classes of crops, and have also been the most important source of food for man and the domestic animals. Their culture antedates the history of civilization. Corn is a native of tropical America. The aborigines of North and South America cultivated it before the discovery by Columbus, and it is only since then that the plant has been introduced into other parts of the world. Teosinte and Job's tears are some of its nearest botanical relatives. The culture of wheat is very old, dating back in China to 2700 B.C. The plant is related to rye, barley, the cultivated rye grasses, and couch grass. Oats have not been cultivated as long as wheat, and they were not known to the ancients. The best known relative of the oat plant is tall oat grass. Barley was grown in ancient Egypt as a food for man and beast. In Europe it constituted the chief bread plant until the 16th century. Rye has not been grown as long as wheat and barley. It was unknown to the Egyptians and the Greeks. This crop furnishes the bread to a large portion of the peasant class of Europe. Rice is the principal food crop of Asia. It was grown in China 3,000 years before the Christian era and was introduced into Europe in the 15th century. The plant is a near relative of wild rice. The millets and the sorghums are also classed with the cereals. See F. L. Sargent's *Corn Plants, their Uses and Ways of Life.*

Cerebellum. See BRAIN.

Cerebral Hæmorrhage is caused by rupture of a blood-vessel in the substance of the brain. See BRAIN; PARALYSIS.

Cerebration See PSYCHOLOGY.

Cerebritis, inflammation of the brain, commonly coincident with meningitis.

Cerebro-spinal Fluid, lymph lying between the coverings of the brain and the spinal cord—the dura mater being the outer, the pia mater the inner covering. Between the two lies a third membrane, the arachnoid, a delicate, weblike tissue. The cerebro-spinal fluid lies between the arachnoid and the pia mater. Some serous fluid, less in quantity than the cerebro-spinal, lies between the dura mater and the arachnoid. The cerebro-spinal fluid has free passage all over the brain and spinal cord, between the membranes, and probably acts as a buffer, or water-bed, to guard the brain and cord from the effects of concussion. It consists mostly of water, is slightly saline, varies in quantity, is most abundant in old people, and is rapidly restored if drained off. It is over-abundant in the morbid condition known as spina bifida, where it forms a tumor.

Cerebro-spinal Meningitis. See MENINGITIS.

Cerebrum. See BRAIN.

Ceres. See DEMETER.

Ceres, the first-known asteroid, was named after the tutelary goddess of Sicily by Giuseppe Piazzi, who discovered it on Jan. 1, 1801. The largest but not the brightest member of the group, its diameter measures 477 m. (Barnard), while its albedo of 0.18 implies a surface reflective of no more than 18 per cent. of the rays striking it. Its orbit has a mean radius of 257 million miles, and is traversed in a period of 4.6 years. It is nearly five times more eccentric than that of the earth, and is inclined 10½° to the ecliptic.

Cereus Giganteus.

Cereus is the genus of Cacti, including some of the largest members of the order; several of the species grow, indeed, to a great height. The best worth cultivating are the pink-flowered *C. fimbriatus*, about twenty feet in height; *C. flagelliformis*, with creeping stems and pink flowers; and the scarlet *C. speciosus*, which grows to about six feet high. This is the so-called torch thistle. Of the night-blooming varieties, the most notable are the climbing *C. grandiflorus*, which produces its lovely white, brown, and yellow flowers through the summer months. These, which reach about eight inches in diameter, begin to open at about eight o'clock in the evening, and begin to close about two or three o'clock in the morning. During the time that they are expanded the flowers give out a pleasant fragrance of great penetration. There are also the larger-flowered, but less powerfully scented, *C. nycticalus*, and the red, orange, and white *C. Macdonaldæ*. The Cereuses are not difficult to grow in a warm greenhouse, if only they receive plenty of air and light. In summer plenty of water should be given them, but in winter it should be given only in small quantities.

The giant cereus (*C. giganteus*) is a familiar object on the arid plains of the Southwest. It grows to a height of 60 ft., and resembles a gigantic tuning-fork at times, although it usually has several thick, ribbed, upright branches. It is studded with blossoms in spring, and in June the vari-colored, fleshy fruits, filled with a multitude of tiny black seeds, are ripe. The plant is known as 'pitahaya,' and the fruits form a staple food of the various Indian tribes in the regions where they grow.

Cerignola, tn. and episc. see, prov. Foggia, Italy, 22 m. S.E. of Foggia. Near by the French, under the Duc de Nemours, were defeated by the Spaniards, commanded by Gonsalvo da Cordova, in 1503. Pop. (1901) 32,028.

Cerigo (anc. *Cythera*), isl., Greece, is the most southerly of the Ionian Is. It is very mountainous and little wooded. The principal crops are wheat, vines, olives, and cotton, and the pasturage is exceedingly good. Large numbers of sheep and goats are exported to Greece. The chief town is Capsali, at the S. end. The island was colonized by the Phœnicians, and was celebrated for the worship of Venus (Aphrodite), who was said to have risen out of the sea near this island. Area, 116 sq. m. Pop. 15,000.

Cerithium, a genus of gasteropod mollusks. The shell is turreted and many-whorled, with a small aperture, and anterior and posterior canals, the latter being the less distinct of the two. The numerous species are widely distributed, but the most typical are tropical.

Cerium (Ce, 140) is an element found in a few rare minerals—*e.g.* cerite, orthite, and the Samarskite of North Carolina—along with similar elements, and silica. It is prepared by the electrolysis of its chloride as a steel-gray lustrous metal, but has its chief application in its oxide, which is an important ingredient of incandescent gas mantles.

Cerro de Pasco, mining tn., cap. dep. Yunin, in the highlands of Peru, 120 m. N.E. of Callao. It has remarkably rich mines of silver and copper. Salt is obtained, and coal at a distance of a few miles. A new road from Oroya, 68 m., completes the rail connection with Lima. Alt. 14,270 ft. Pop. about 14,000.

Cerro Gordo, BATTLE OF, a battle of the Mexican War, fought on April 18, 1847, at the pass of Cerro Gordo, on the road connecting Vera Cruz and Jalapa, between about 8,500 Americans under Gen. Winfield Scott and about 12,000 Mexicans under Gen. Santa Anna. Though the Mexicans were superior in numbers to the Americans and occupied a position of extraordinary strength, they were defeated and driven in great disorder from the field, the American plan of battle being determined by a reconnoissance made by Capt. Robert E. Lee. The American loss in killed and wounded was about 430, that of the Mexicans probably about 1,000, though the exact number is unknown. In addition, about 3,000 Mexican prisoners were taken, including five generals. This was the first serious engagement, after the capture of Vera Cruz, in the Southern campaign, Gen. Scott proceeding from Cerro Gordo on his march to the city of Mexico.

Cerro Largo, dep. in N.E. of Uruguay, S. America, bounded on the N.W. by the Rio Negro, and on the E. by Brazil, covered with well-watered grassy downs, on which large herds of cattle are grazed. Its area is 5,753 sq. m., and pop. (1902) 37,979. The capital is Cerro Largo or Melo; pop. 8,000.

Certaldo, vil., prov. Florence, Italy, 18 m. S.W. of Florence; is the place where Boccaccio (born in 1313) lived and died (1375). Pop. (1901) 9,129.

Certificate, a writing which testifies that a certain thing has, or has not, taken place. Properly authenticated, it gives notice from one court to another of anything done therein, and is a judicial act. Certificates by certain officers may be used in evidence at a trial.

Certified Check, a check that has been presented at the bank upon which it is drawn and officially declared to be 'good.' This is done in writing, generally on the face of the instrument under the signature of some one in authority. It simply means that the drawer of the check has at the time the amount of the check on deposit in the bank. The effect of certification is to make the holder a new depositor to that amount, and the bank becomes liable to him.

Certiorari, a writ by which a superior court requires an inferior court to send to the former the record of some proceeding pending in the latter. It lies in most of the states of the United States and in England, where it is issued out of the High Court. In 1891, when federal Circuit Courts of Appeal were established in the United States, a statute provided that a writ of certiorari might issue out of the Supreme Court to bring before it the records of the Circuit Court for review. U. S. Rev. St. 1 Supp. 903.

Certosa di Pavia, a Carthusian Monastery of Italy, 5 m. N. of Pavia, was begun in 1396 by Giovanni Galeazzo Visconti, Duke of Milan. The church has a profusely decorated façade (1473 onwards), one of the richest examples of Renaissance work in Italy, and inside is adorned with numerous fine pieces of sculpture, including the tombs of the founder, of Lodovico Moro and of his wife, Beatrice d'Este, as well as paintings by Borgognone, Solari, Luini, and others. A liqueur is manufactured in the monastery. The monastery was dissolved in 1866, and in 1891 was proclaimed a national monument of Italy. Close by, Francis I. of France was defeated and taken prisoner by the imperialists in 1525. See Beltrami's *La Certosa di Pavia* (1891).

Cerumen (Lat. *cera*, 'wax'), the yellow waxy substance secreted by certain glands in the outer ear, in the passage leading to the drum or tympanum. Its function is to catch solid foreign particles, and thus to guard the tympanum; but in cases of inflammation of the passage it is secreted in excess, and may then cause deafness by obstruction. It can be removed by dropping a little glycerine and water into the ear, to soften the wax, and by then syringing the ear with warm water.

Cervantes-Saavedra, MIGUEL DE (1547–1616), Spanish novelist, poet, and dramatist, born at Alcalá de Henares. He was educated under the famous humanist, Juan Lopez de Hoyos; but on the coming of Cardinal Giulio Acquaviva to Madrid (1568) to condole with Philip II. on the loss of his son Don Carlos, Cervantes was appointed to an office in the nuncio's household, and accompanied his master to Rome. Leaving this service (1570), for the next five years he lived the life of a soldier. In the naval battle of Lepanto (1571), he had his left hand permanently injured, gaining thus forever his glorious nickname of *el manco de Lepanto*. He continued fighting against the Turks until 1575, when he sailed from Naples to Spain; but he was captured at sea by pirates, and carried, with his brother Rodrigo, as a slave to Algiers. He remained in captivity for five years. His one solace in his slavery had been verse, and on his return to Madrid (1582) from the campaign for the conquest of Portugal he settled down to a career of letters. In 1594 he was employed on the commission to enforce payment of overdue taxes in the province of Granada. A bill drawn by him in 1595 on account of his office was protested in Seville, and after a long and costly lawsuit he was cast into prison for the debt (1597). Released on bail, he remained in Seville as a commission agent until 1603, when the lawsuit being transferred to Valladolid, Cervantes had to go thither. Here a further misfortune befell him. His house in the Calle del Rastor was near the place where a noble, Gaspar de Ezpeleta, was mortally wounded by some unknown person on the night of June 27, 1605. Cervantes, attracted by the cries for aid, was found supporting the dying man when the watch arrived. He and his family were thrown into prison on suspicion, but after some delay they were declared innocent and released. The court being transferred to Madrid (1606), Cervantes again changed his residence, to end the lawsuit that had embittered his life. Here he lived for the next ten years in a dire struggle with poverty, until death released him in 1616. He was buried in the church of the Trinitarian nuns in Calle Cantaranas, afterwards the Calle de Lope de Vega.

His best-known and his own favorite poetical work is the *Galatea*, a pastoral narrative tale, first published in 1585. Although the prose of Cervantes has overshadowed his poetry, of which he was so proud, there are verses of great beauty in the *Galatea*, and in *El Viage al Parnaso*. As a dramatist Cervantes worked hard, but not successfully, though he himself thought highly of his plays. In the *Adjunto al Parnaso* he enumerates those of his dramas which he considers the best—among the number, *El Trato de Argel*, *La Numancia*, and *La Confusa*, of which the last named is perhaps the best.

It is, however, as a novelist that Cervantes has become immortal. Successive writers have endeavored to discover in *Don Quixote* a great political satire; but the truth of Cervantes's own assurance is now generally admitted, that his sole desire was to write an amusing book to give the *coup de grâce* to the absurd books of chivalry imitating Amadis that had done so much to pervert Spanish character. The book must have been begun later than 1591, but the suggestion that he wrote it in a jail in Argmasilla de Alba rests alone upon tradition and a conjectural interpretation of a remark made by Cervantes in the prologue. In any case, it was famous in manuscript for some time before a license was granted (Sept. 26, 1604) to print the first part. The book seems to have been first sold at the beginning of the year 1605. Lope de Vega wrote slightingly of it shortly before; but the public read it with avidity, five (or six, if there really was a Barcelona edition of 1605) editions appearing before the end of 1605. In 1614 a spurious second part was published, the work of an unknown author assuming the name of Alonso Fernandez de Avellañeda—an amusing book, but inferior to the work of Cervantes. The latter, stung to the quick by this piracy, hurried the conclusion of his own second part, in which he bitterly attacks Avellañeda. The genuine second part, with the exception of some of the concluding chapters, is, if anything, superior to the first.

In 1613 Cervantes issued his twelve *Novélas Exemplares* (Eng. trans. by MacColl, 1902, etc.)—short stories written at considerable intervals. They abound in wit and vivacity, rivalling even *Don Quixote* itself, and have maintained their popularity to the present day. Cervantes's last work was *Los Trabajos de Persiles y Sigismunda*, written in 1616, the dedication to the Count de Lemos being signed four days before the author's death (Apr. 23). In May, 1905, the tercentenary celebration of Don Quixote took place at Madrid.

The best bibliographical references in English to *Don Quixote* will be found in the introduction, by Mr. Fitzmaurice Kelly, to Mr. Ormsby's translation of the work (1901). A good Spanish bibliography of the whole of Cervantes's writings is that by Leopoldo Ruis y Llosellas (1895). The best Spanish biography of Cervantes is that by Fernandez de Navarrete (1819). The most scholarly edition of *Don Quixote* in Spanish has recently been published in London by Mr. J. Fitzmaurice Kelly (1892); and the biography (1892) by the same English scholar is also excellent, as is Mr. H. E. Watt's *Life of Cervantes* (1894).

Cervera y Topete, PASQUAL (1833–1909), Spanish admiral, was born, of a wealthy family, at Jerez, prov. of Cadiz, Spain, and was educated (1848–51) at San Fernando. In the early part of his career, he distinguished himself in operations on the coast of Morocco (1859–60), in the early days of the first Cuban war (1868–78), and in the revolutionary struggles in Spain. He was regularly promoted and received numerous decorations, and in 1892 was Minister of Marine in Sagasta's cabinet. At the outbreak of the Spanish-American War (1898) he sailed with secret orders to defend Spanish interests in Cuba in command of a squadron composed of the cruisers *Infanta María Teresa*, *Cristóbal Colon*, *Almirante Oquendo*, and *Vizcaya*, accompanied by three torpedo-boat destroyers. He eluded the American fleet, reached Santiago on May 19, and was there blockaded by Admiral Sampson. Our naval forces failed to block the harbor by sinking the *Merrimac*, and on July 3 the Spanish fleet, compelled by public opinion in Spain, though against Cervera's better judgment, attempted an escape; but the ensuing naval action resulted in the destruction or capture of every Spanish ship, the death of one-third of their men, and the surrender of Cervera as prisoner of war. He was treated on his arrival in the U. S. with great distinction, and on his return to Spain at the close of the war was honorably acquitted by a formal court-martial.

Cervetri, or CERVETERE, vil., prov. Rome, Italy, 20 m. N.W. of Rome, occupies a corner inside the walls of the ancient Etruscan city of Cære, and is famous for its Etruscan graves, many of them hewn in the solid rock. The ancient city carried on an extensive commerce, and flourished down to the 13th century. See CÆRE.

Cervidæ, the deer family; one of the families included in the Pecora, or true ruminants. The family characteristics are that antlers are frequently, though not invariably, present in the male; that the upper canines, absent in sheep and ox, are here present, and may be large in the male; that at least the first molar tooth in each jaw retains the primitive short-crowned (brachydont) condition; and that the lateral toes, the second and the fourth, are almost always present on both feet. In other respects deer resemble sheep and oxen, save in some minor points. The family Cervidæ is divided into two sub-families, the one including only the aberrant musk-deer (*Moschus*), the other the true deer, widely distributed over the globe, but absent from Africa and Australia.

Cervin, MONT. See MATTERHORN.

Cesalpini. See CAESALPINUS, ANDREAS.

Cesarevitch. See TSAR; also RACE MEETINGS.

Cesari, GIUSEPPE (1568–1640), called IL CAVALIERE D'ARPINO, enjoyed a great reputation as a painter at Rome; he was the rival of Carracci and Caravaggio. His paintings, though pleasing, lack accuracy and perspective. His best works are the death of Cicero, and a Roman battle scene.

Cesarotti, MELCHIORE (1730–1808), Italian writer, born at Padua, where he was appointed professor of Greek and Hebrew (1768), a position he held for the remainder of his life. Of his original works the most important is the *Saggio sulla Filosofia delle Lingue* (1785), in which he advocates a free development of language, in opposition to the tenets of the Della Cruscan Academy at Florence. As a translator, he attempted a prose version of the *Iliad*, followed by a long verse paraphrase, in 10 vols.; *La Morte d'Ettore;* and also rendered some of Voltaire's plays and Gray's *Elegy* (1772). But his great achievement is the translation (in blank verse) of Macpherson's *Ossian* (1763; complete ed. 1772), which aroused extraordinary interest in Italy, and exercised a great influence both there and in other countries, his introductory dissertation being translated into English and edited with notes by J. M'Arthur in 1806. See Lives by Barbieri (in the *Opere*, in 40 vols. 1800–13), by Maggi (Introd. to the *Opere Scelte*, 1820). See, too, Mazzoni's preface to the *Prose edite ed inedite* (1882).

Cesena (anc. *Cæsena*), tn. and episc. see, prov. Forli, Italy, 17 m. N.W. of Rimini; has a cathedral, a citadel, and the valuable Malatesta library. The Popes Pius VI. (1717) and Pius VII. (1742) were born here. The place is famous for its wine and its hemp, and the people spin silk and mine sulphur. Here the French defeated the Austrians in 1815. Its history is alluded to by Dante (*Inferno*, xxvii. 52). Pop. (1901) 42,509.

Cesnola, LUIGI PALMA DI, COUNT (1832-1904), Italian-American archæologist, was born at Rivarolo, near Turin, and was educated at the Royal Military Academy in the latter city. He fought in the war against Austria in 1848–49 and was a staff officer in the Crimean War. In 1860 he came to the U. S. and served with distinction on the Union side in the Civil War until 1863, when he was wounded and taken prisoner. In 1865 he was made a brevet brigadier-general, was naturalized, and appointed U. S. consul to Cyprus. He there spent ten years in a series of interesting excavations at Curium, Larnaca, and Dali. His collection of statuary, pottery, jewelry, and other objects of art was bought by the Metropolitan Museum of Art in New York city in 1873, where it is known as the Cesnola Collection. About 5,000 valuable objects were lost at sea near the coast of Syria while on their way to the U. S. in 1871, but the greater part of these were duplicates. Several foreign museums, as well as the Smithsonian Institution at Washington, received gifts of art duplicates from Gen. Censola, and the Boston Museum bought a small collection. He was director and a trustee of the Metropolitan Museum from 1878 till his death. The genuineness of many of the articles he had collected was disputed for a time (1879), but the general worth of the collection was finally admitted, after a lawsuit in which the matter was thoroughly investigated. In 1880 Gen. Cesnola received the degree of LL.D. from Columbia University. He wrote *Cyprus, its Ancient Cities, Tombs, and Temples* (1878), a *Description of the Metropolitan Museum of Art* (1882), and an *Atlas of the Cesnola Collection* (1885), besides various pamphlets on art subjects. See *The Cesnola Collection of Cypriote Antiquities*, a 'summary' by John Taylor Johnston, President of the New York Metropolitan Museum of Art, in the 1878 edition of Cesnola's *Cyprus*.

Cespedes, PABLO DE (1536–1608), Spanish painter, architect, and poet, born at Cordova; in early life was distinguished as a scientist and linguist. Later on he devoted himself to sculpture and painting under Michael Angelo. His principal picture is the *Last Supper*, in Cordova Cathedral, of which he was appointed a prebendary (1577). See Tubino's *P. de Cespedes* (1868).

Cespedes y Borgas, CARLOS MANUEL DE (1819–74), Cuban patriot, was born at Bayamo, Cuba, received his education in Havana and in Spain, and was admitted to the bar at Madrid (1842). He was connected with General Prim's attempt against the Spanish Government (1844), and returned to Bayamo, where he chiefly lived, engaged in the practice of the law and literary work until the Cuban insurrection of 1868, which he inaugurated with a manifesto. The following year a Cuban Congress met at Guáimaro and Céspedes was elected President by acclamation, remaining at Guáimaro until 1870, when driven out by the Spaniards. After three years of struggle he lost his influence with the Cubans and was deposed from the presidency in 1873. The cause of his death has remained a mystery.

Cessio Bonorum. In civil law, a process whereby a debtor made an assignment for the benefit of his creditors. The debtor was then exempt from imprisonment.

Cession (Lat. *cessio*, 'surrender'), the formal transfer of territory from one state to another by the act of the state making the cession. Some deference is usually paid to the wishes of the inhabitants of the ceded territory, but it is not a recognized rule of international law that the transfer must be with the consent of the people. Cessions are made by way of sale, exchange, or gift, or are exacted by a conqueror as a condition of peace. The civil and political rights of the inhabitants of the ceded territory are usually determined by the treaty of cession. In the case of earlier cessions of territory to the United States, it was usually stipulated by the ceding nation that the inhabitants of such territory should as soon as possible be admitted to all the rights and immunities of citizens of the United States, and that in the meantime they should be maintained and protected in their liberty, property, and in the religion which they professed. The Treaty of Paris, under which the Philippines and Porto Rico were ceded by Spain, merely stipulated that the civil rights and political status of the inhabitants of the ceded territory should be determined by the Congress of the U. S. In the absence of express stipulations, the inhabitants change their allegiance and acquire a share in all the rights of their new state. At the same time they carry with them all their local obligations, local rights, and property. The new state is liable for the local debts of the ceded territory and those secured upon special revenues. There are instances where the new state has charged itself with a part of the general debt. Most treaties of cession contain a clause dealing with the question of debts. See CONQUEST; also Hall's and Wheaton's *International Law.*

Cestoda. See TAPEWORMS.

Cestracion, a genus of sharks of a somewhat primitive type. The living species, known as Port Jackson sharks, are confined to the Pacific Ocean; none exceed five feet in length.

Cestui que Trust. See TRUSTS.

Cestum Veneris, or VENUS'S GIRDLE, a beautiful marine organism belonging to the Ctenophora, remarkable for its elongated, ribbon-like form.

Cestus. **(1.)** Thongs of leather worn by Greek and Roman boxers on their hands; not like modern boxing-gloves, to soften their blows, but to make them more severe. They were often weighted with lead and iron. **(2.)** The magic girdle of Aphrodite (Venus), which caused its wearer to inspire love in all beholders. See *Iliad*, bk. xiv.

Cetacea, an order of marine mammals, including whales, dolphins, porpoises, and their allies. From fish they differ in their warm blood, four-chambered heart, air-breathing habit, and many other characters; but they are very perfectly adapted for life in water. The body is spindle-shaped, the head is always large, and the tapering tail is furnished with powerful 'flukes,' which are the main agents of propulsion of the body. Hind limbs are entirely absent, and the fore limbs are converted into elongated paddles, without external traces of nails or fingers. Hairs are present only in the young, or are few in number and confined to the mouth region; the hairy coat is functionally replaced by the thick layer of blubber beneath the skin, which serves to retain the heat of the body. The nostrils open near the summit of the head in a single and double blowhole, the eye is small, there is no external ear, and the auditory aperture is minute. Of the many peculiarities of the skeleton, we can only mention that the bones are spongy and filled with oil, the neck short and stiff, the posterior portion of the vertebral column very freely movable, the skull greatly modified in association with the shifting backwards and upwards of the nostrils, while clavicles are absent, and the fore limbs curiously modified. Teeth may be present or absent, and in the latter case are functionally replaced by the horny plates or baleen of the whalebone whales. Though the stomach is complex, the animals are all carnivorous, the majority feeding on fish, cuttle-fish, crustaceans, or small marine organisms of various kinds. The cetaceans are very widely distributed—the majority in the sea, a few in the rivers of Asia and S. America. Their whole life is passed in the water, and they are absolutely helpless on land. In the sea the young are brought forth and reared, special structural adaptations making the process of lactation possible under water. In spite of this aquatic habit, whales are as purely air-breathers as the horse or the cow, and must of necessity rise periodically to the surface to breathe, an operation which is facilitated by the horizontally placed tail-flukes. The majority are gregarious, swimming in herds or schools; and the females exhibit great devotion to their young, of which only one is usually produced at a birth.

Living Cetacea are divided into two sharply contrasted sets—the toothed whales, or Odontoceti, and the whalebone whales, or Mystacoceti; but the presence or absence of teeth, the character upon which the division is based, is only one of a number of differences between the two, differences especially marked in the structure of the skeleton. For toothed whales see articles CACHALOT, DOLPHIN, PORPOISE, BOTTLENOSE, NARWHAL; for whalebone whales see under that heading, also RIGHT WHALE, RORQUAL. Consult F. Beddard, *Book of Whales* (1900); F. Bullen, *Denizens of the Deep* (1904).

Ceteosaurus is the name given by Professor Owen to an extinct reptile of gigantic size, the remains of which have been found in the Oolitic strata of England. The head and neck were missing, but from the dimensions of the body it is inferred that the animal was not less than thirty-six feet in length and ten in height. The shoulder-blades are nearly five feet long. It belongs to the Dinosaurs, and is a member of the family of Atlantosaurs, which includes some of the largest animals known to have inhabited the globe. The shape of their teeth indicates that they lived on vegetable food. See Hutchinson's *Extinct Monsters* (1892), and Sir Richard Owen's *British Fossil Reptiles* (1849).

Cetinje. See CETTINJE.

Cetotolites, the tympanic and petrosal parts of the ear-bone of whales, are among the hardest and most durable of all organic structures, and are especially adapted for preservation in the fossil condition. They are not infrequent in the Pliocene beds of Great Britain, and much of our knowledge of extinct species of Cetacea is founded on them. To some extent they have been used as a source of superphosphates and artificial manures.

Cette (anc. *Setion*), seapt., dep. Hérault, France, 17 m. S.W. of Montpellier, at the meeting-point of the Canal du Midi with the Mediterranean. The town has a good harbor. The chief article of trade is wine. Cette is of Greek foundation, but it dates its rise only from the 17th century. It has sea-bathing and mineral springs. Pop. (1901) 33,246.

Cettinje (pron. *Settinya*), cap. of Montenegro, 12½ m. from Cattaro; the see of the metropolitan and the residence of the prince; has an arsenal, state library, national museum, theological seminary, girls' high school, and remains of an ancient monastery. Cettinje was burnt by the Turks, in 1683, 1714, and 1785. Pop. about 3,000.

Cetus, an ancient constellation to the south of Aries. Although covering an expanse of sky 50° by 20°, it includes no star as bright as the second magnitude. Mira, in the neck of the Whale, is the first known periodical star. In one of its bright phases, on Aug. 13, 1596, it attracted the attention of David Fabricius, and was found to fluctuate in about 331 days from 1.7 to 9.5 magnitude. The constellation is crowded with 'white' nebulæ, the most conspicuous among them being an elliptical formation discovered by Caroline Herschel in 1783, and resolved into a spiral in a photograph taken by Dr. Roberts, Dec. 25, 1899.

Cetywayo, or, more phonetically, KETSHWYO (*c.* 1836–84), son of the Zulu king Panda, whom he deposed in 1856. After defeating his brother Umbulazie, his succession was recognized by Natal, conditionally on his disbanding his formidable army and ceasing his sanguinary methods of government. The annexation of the Transvaal (1877) imposed upon Britain the necessity of enforcing these conditions; and the Isandhlwana disaster (1879), partially retrieved at Rorke's Drift, preceded the victory of Ulundi (1879). Cetywayo was captured by Major Marter (1879) and imprisoned at Cape Town. In 1882 he was brought to Britain, where mistaken public sympathy procured his restoration to a part of his country (1883). Soon after he was attacked and defeated by Usibepu, one of his ancient enemies, and Cetywayo was compelled to seek shelter in the native reserve.

Ceuta, fort. seapt. belonging to Spain, but situated at the E. extremity of the Moroccan peninsula which juts out N. towards Gibraltar. It answers to the ancient Abyla, one of the mythical Pillars of Hercules. Ceuta consists of an old town on the tongue of the peninsula, and a new town climbing up the hills behind. It is a bishop's see, and has a 15th century cathedral. The fortifications were greatly strengthened in the end of the 19th century, and it is now (1906) proposed to convert Ceuta into a first-class fortress, although it is to some extent commanded by Tetuan, 23 m. to the S. Under both Roman and Arab rule Ceuta was a busy centre of trade and industry. It was conquered by King João I. of Portugal in 1415, and passed to Spain in 1580. Pop. (1900) 13,269, embracing Spaniards (inclusive of garrison of 3,500, and 2,000 to 2,500 convicts), Moors, Negroes, Jews, and other races.

APPENDIX OF PRONUNCIATION TO NELSON'S ENCYCLOPÆDIA.

I. EXPLANATORY NOTE.

In the vocabulary of this Appendix the correct pronunciation is indicated of all titles which present any difficulty in that respect. Titles are omitted when the pronunciation is indicated by the spelling (as abatement, Adams, Aiken, Bates, etc.), or by connection with titles given in the Appendix.

A simple system of respelling is adopted based upon the usual values of the vowels and consonants in English; and such diacritical marks as are used are those in general use in school textbooks. The values of the symbols used are given in the accompanying Key, with explanations of the way to pronounce correctly the few foreign sounds which are not fairly well represented by English sounds. Except as otherwise noted in the Key, the letters used in respelling are to be given their ordinary English values. Further information as to the values of the letters in the alphabets of foreign languages will be found in the article on PRONUNCIATION in the Encyclopædia.

II. KEY.

ā as in fate, rebate.
â as in care, mare, or as *ai* in fair, or as *e* in there
a (unmarked) as in fat, am.
ä as in arm, father.
ȧ as in ask.
a as in America.
ē as in me, evade.
e (unmarked) as in met, end.
e as in moment, maker.
ī as in ice, mine.
i (unmarked) as in fit, it.
ō as in old, over, obey.
o (unmarked) as in odd, not.
ô as in nor, or as *a* in fall.
oi as in boil, noise.
o͞o as in boot, fool, or as *u* in rude.
o͝o as in book, or as *u* in full, put.
ū as in mule, unite.
u (unmarked) as in but, up.
û as in turn, burn, or as *e* in her, or as *i* in fir; also for French *eu* and for German ö.
ü for French *u* and German ü. This sound may be imitated by pronouncing *e* as in English me and at the same time firmly rounding the lips as for pronouncing *oo* in fool.
y as in yet.
ch as in church.
ch as in German ich. This is the front palatal continuant, and is pronounced with the blade of the tongue raised almost to the hard palate, producing a sound resembling a strong pronunciation of the *h* in hew, or the sound of *k* in key pronounced without complete stoppage of the breath.
g as in go, girl.
h as in hit; also for Spanish *g* before *e* and *i*, and for other foreign sounds which are similar strong guttural fricatives.
hw as *wh* in when.
ᴋ as *ch* in Scotch loch, and German ach, or as *g* in German tag, berg. This is the back palatal, or guttural, continuant, and is pronounced with the tongue raised almost to the palate, producing a sound somewhat resembling that made in clearing the throat.
ṅ is used to indicate a nasal pronunciation of the preceding vowel, as in French bon. The nasal vowels are pronounced somewhat as if blended with the sound of *ng* in song, pronounced without the complete closure for the *g*.
th as in thick, though.
ᴛʜ as in then, thus.
zh as *z* in azure, or as *s* in measure.
An apostrophe ['], when used, denotes an almost complete elision of the vowel which it replaces or indicates a syllabic consonant, as in tā′k'n (taken), spaz'm (spasm).

Volume II.—Bedmar to Ceuta.

Bedmar, bed-mär′.
Bedouins, bed′o͝o-inz *or* -ēnz.
Beelzebub, bē-el′zi-bub.
Beeroth, bē-ē′roth *or* bē′rōth.
Beers, bērz.
Beersheba, bē′*e*r-shē′b*a* *or* bē-ûr′shē-b*a*.
Beethoven, bā′tō-v*e*n; *Du.* bāt′hō-v*e*n.
Beets, bāts.
Befana, bā-fä′nä.
Beg, beg; *Turk.* bā.
Begas, bā′gäs.
Beghards, beg′ärdz *or* beg-ärdz′.

Bègles, beg′l'.
Begonia, bi-gō′ni-*a*.
Beguines, beg′inz *or* bā-gēn′.
Begum, bē′gum.
Behaim, bā′hīm.
Behemoth, bē-hē′moth *or* -mōth.
Behera, be-hā′rä.
Behistun, bā his-to͞on′.
Behm, bām.
Behmen, bā′m*e*n.
Behn, bān *or* ben.
Behring, bē′ring; *Danish* bā′ring.
Beijerland, bī′y*e*r-länt.
Beilan, bā-län′.
Beilstein, bīl′shtīn.
Beira, bā′ē-rä.
Beirut, bā′ro͞ot *or* bā-ro͞ot′.
Beishehr Gol, bā-she′h'r gûl.
Beissel, bī′s*e*l.
Beit-el-Fakih, bāt′el-fä′kēh.
Beja, bā′zhä.
Bejan, bē′j*a*n.
Bekaa, bē′kä.
Beke, bēk.
Békés, bā′kāsh.
Bekker, bek′*e*r.
Bela, bā′lo.
Belbeis, bel-bās′.
Belfast, bel-fȧst′ *or* bel′fȧst.
Belfort, bel-fôr′.
Belgæ, bel′jē.
Belgaum, bel-gä′o͝om.
Belgiojoso, bel-jō-yō′sō.
Belgium, bel′ji-um.
Belgrade, bel-grād′.
Belgravia, bel-grā′vi-*a*.
Belial, bē′li-*a*l.
Belinsky, be-lin′ski.
Belisarius, bel-i-sā′ri-us.
Belize, b*e*-lēz′.
Beljame, bel-zhâm′.
Belknap, bel′nap.
Belladonna, bel-*a*-don′*a*.
Bellagio, bel-lä′jō.

Bellahouston, bel-*a*-ho͞os'-t'n.

Bellaire, bel-âr'.

Bellamy, bel'*a*-mi.

Bellarmine, bel'är-min *or* -mēn.

Bellarmino, bel-är-mē'nō.

Bellary, be-lä'ri.

Bellatrix, bel'*a*-triks.

Bellay, be-lā'.

Belle Alliance, bel-lȧl-i-äṅs'.

Bellefontaine, bel-fon'-tān.

Bellefonte, bel-font'.

Belle Fourche, bel fo͞orsh'.

Belle-Île-en-Mer, bel-lē'-läṅ-mâr'.

Belle Isle, bel īl'.

Belle-Isle, bel-lēl'.

Bellenden, bel'*e*n-d*e*n.

Bellerophon, be-ler'ō-fon.

Bellevue, bel-vū'.

Bellew, bel'ū; *often* be-lo͞o'.

Belley, bel-ā'.

Belli, bel'lē.

Bellicent, bel'i-s*e*nt.

Bellingham, bel'in-j*a*m.

Bellingshausen, bel'ingks-hou'z*e*n.

Bellini, bel-lē'nē.

Bellman, bel'män.

Bello, bel'lō.

Belloc, be-lok'.

Bello Horizonte, bel'ō ō-rē-sōn'tā.

Bellona, bel-ō'n*a*.

Bellot, bel-ō'.

Belloy, bel-wä'.

Belluno, bel-lo͞o'nō.

Belmez, bel-māth'.

Belmont, bel'mont.

Beloit, bē-loit'.

Belomancy, bel'ō-man-si.

Belon, b'lôṅ.

Belovar, bel'ō-vär.

Belphœbe, bel-fē'bi.

Belsham, bel'sh*a*m.

Belshazzar, bel-shaz'*a*r.

Beltane, bel'tān.

Beltrami, bel-trä'mē.

Beluga, be-lo͞o'g*a*.

Belus, bē'lus.

Belvedere, bel-vi-dēr'; *Ital.* bel-ve-dā'rā.

Belvidere, bel-vi-dēr'.

Belvisia, bel-vis'i-*a*.

Belvoir, bē'v*e*r.

Belzoni, bel-tsō'nē.

Bem, bem.

Bembo, bem'bō.

Bemidji, bē-mij'i.

Bemis, bē'mis.

Benacus, Lacus, lā'kus be-nā'kus.

Benares, ben-ä'rez *or* -rēz.

Benbow, ben'bō.

Bencoolen, ben-ko͞o'len.

Benczur, ben'tso͞or.

Benda, ben'dä.

Bendemann, ben'd*e*-män.

Bender, ben'd*e*r.

Bender Abbas, ä-bäs' *or* ä'bäs.

Bendigo, ben'di-gō.

Bendire, ben-dē'rē.

Benedek, bā'n*e*-dek.

Beneden, bā'n*e*-den.

Benedetti, bā-nā-det'tē.

Benedicite, ben-i-dis'i-tē.

Benedict, ben'i-dikt.

Benedictine, ben-i-dik'tin *or* -tēn.

Benedix, bā'n*e*-diks.

Beneke, bā'n*e*-k*e*.

Benevento, bā-nā-ven'tō.

Benfey, ben'fī.

Bengal, ben-gôl'.

Bengali, ben-gô'li *or* ben-gä'li.

Bengazi, ben-gä'zē.

Bengel, beng'*e*l.

Benguella, beng-gā'lä.

Benguet, ben-gāt'

Benhadad, ben-hā'dad.

Benham, ben'*a*m.

Beni, bā-nē'.

Benicia, be-nish'i-*a*.

Beni-Hassan, bā'nē-häs'-sän.

Benin, ben-ēn'.

Beni-Saf, bā'nē-säf'.

Beni-Suef, bā'nē-swef'.

Benkovac, ben'kō-väts.

Benkulen, ben-ko͞o'len.

Ben Lomond, ben lō'mund.

Ben Macdhui, mak-do͞o'i.

Ben More, mōr.

Benne-oil, ben'i.

Ben Nevis, nē'vis *or* nev'-is.

Bennigsen, ben'ig-s*e*n.

Benoit, b*e*-nwä'.

Bensberg, bens'ber*ch*.

Bentham, ben't*a*m *or* ben'-th*a*m.

Benthamia, ben-thā'mi-*a*.

Bentinck, ben'tingk.

Benue, ben-wē'.

Ben Venue, ben ven'ū.

Benvenuto, ben-vā-no͞o'tō.

Benzaconine, ben-zak'ō-nin *or* -nēn.

Benzaldehyde, ben-zal'di-hīd.

Benzine, ben'zin *or* ben'-zēn.

Benzoic, ben-zō'ik.

Benzoin, ben'zō-in; *colloq.* ben'zoin.

Benzoline, ben'zō-lin *or* -lēn.

Benzyl chloride, ben'zil klō'rid *or* -rīd.

Beograd, be'ō-grät.

Beothy, bā'û-ti.

Beowulf, bā'ō-wo͝olf.

Berabra, ber-ä'brä.

Béranger, bā-räṅ-zhā'.

Berar, ber-är'.

Berat, ber-ät'.

Berber, bûr'b*e*r.

Berbera, b*e*r-bā'rä.

Berberidaceæ, bûr-b*e*r-i-dā'si-ē.

Berbers, bûr'b*e*rz.

Berbice, b*e*r-bēs'.

Berceuse, ber-sûz'.

Berchem, ber*ch*'*e*m.

Berchet, bâr'shā.

Berchta, ber*ch*'tä.

Berdichev, ber-dyē'chef.

Berdyansk, ber-dyänsk'.

Berea, be-rē'*a*.

Bereg, ber'eg.

Berendt, bā'r*e*nt.

Berengar, bā'r*e*n-gär.

Berengaria, bā-ren-gä'-rē-ä.

Berengarius, ber-en-gā'ri-us *or* -gä'rē-o͞os.

Berenice, ber-e-nī'sē.

Beresford, ber'es-f*e*rd.

Berezin, ber-yā'zēn.

Berezina, ber-yā'zē-nä.

Berg, ber*ch*.

Bergaigne, ber-gā'ny'.

Bergamo, bär'gä-mō.

Bergamot, bûr'g*a*-mot.

Bergen, *Belgium*, ber*ch*'-*e*n; *Norway*, bär'g*e*n.

Bergen-op-Zoom, ber*ch*'-*e*n op-zōm'.

Bergen Point, bûr'g*e*n.

Bergerac, ber-zh'rȧk'.

Bergh, bûrg.

Berghaus, ber*ch*'hous.

Bergk, berk.

Bergman, ber*ch*'män.

Bergmann, ber*ch*'män.

Bergun, ber'gün.

Berhampur, bur'um-po͝or *or* -po͞or'.

Beriberi, ber'i-ber'i.

Bering, bē'ring; *Danish* bā'ring.

Bériot, bā-rē-ō'.

Berja, ber'hä.

Berkeley, bûrk'li; *in England often* bärk'li.

Berkhamstead, bûrk-ham'sted *or* bärk-.

Berkshire, bûrk'shir; *in England often* bärk'shir.

Berlad, bûr'lät.

Berlichingen, ber'li*ch*-ing-*e*n.

Berlin, bûr-lin'; *Ger. pron.* ber-lēn'.

Berliner, bûr-lin'*e*r; *Ger. pron.* ber-lē'n*e*r.

Berlioz, ber-lē-ōs'.

Bermejo, ber-mā'hō.

Bermondsey, bûr'mun-zi.

Bermuda, b*e*r-mū'd*a*.

Bermudez, ber-mo͞o'dās.

Bernadotte, bûr'n*a*-dot; *Fr. pron.* ber-nȧ-dot'.

Bernard, bûr'närd *or* ber-närd'; *Fr. pron.* ber-när'.

Bernauer, ber'nou-*e*r.

Bernays, bûr'nīs.

Bernburg, bern'bo͝or*ch*.

Berne, bern; *Eng.* bûrn.

Berners, bûr'n*e*rz.

Bernese Oberland, ber-nēs' ō'b*e*r-länd *or* ber-nēz'.

Bernhard, bern'härt.

Bernhardt, bern'härt; *Fr. pron.* ber-när'.

Berni, ber'nē.

Bernicia, b*e*r-nish'i-*a*.

Bernina, ber-nē'nä.

Bernini, ber-nē'nē.

Bernoulli, ber-no͞o'yē.

Bernstein, bern'shtīn.

Bernstorff, bern'stôrf.

Berœa, ber-ē'*a*.

Berosus, ber-ō'sus.

Berre, ber.

Berri, or **Berry**, ber-ē'.

Berruguete, ber-ro͞o-gā'tā.

Berryer, ber-ē-ā'.

Bersaglieri, bâr-sä-lyer'ē.

Berseem, b*e*r-sēm'.

Berserks, bûr's*e*rks.

Bert, bâr.

Berthelot, ber-t'lō'.

Berthier, ber-tyā'.

Berthold von Regensburg, ber'tōlt fon rā'-g*e*ns-bo͝or*ch*.

Berthollet, ber-tō-lā'.

Bertholletia, bûr-thol-ē'-shi-*a*.

Berthoud, ber-to͞o'.

Bertillon, ber-tē-yôṅ'.

Bertin, ber-taṅ'.

Bertrand, ber-träṅ'.

Bertran de Born, ber-träṅ'd*e* bôrn'.

Bervic, ber-vēk'.

Berwick, *tn. U. S.* bûr'wik; *Eng.* ber'ik.

Beryl, ber'il.

Beryllium, be-ril'i-um.

Berzelius, b*e*r-zē'li-us; *Swedish* ber-zel'ē-o͝os.

Bes, bās.

Besançon, b*e*-zäṅ-sôṅ'.

Besant, bez'*a*nt *and* bē-sant'.

Besika, be-sē'kä.

Beskid, bes'kēd'.

Beskow, bes'kov.

Bessarabia, bes-*a*-rā'bi-*a*

Bessarion, bes-ā'ri-on.

Bessel, bes'*e*l.

Bessels, bes'*e*ls.

Bessemer, bes'i-m*e*r.

Bessières, be-syâr'.

Bestiary, bes'ti-ā-ri.

Besuki, bā-zo͞o'kē.

Beta, bē't*a* *or* bā't*a*.

Betelgeux, bet'*e*l-gûz'.

Betel, bē't*e*l.

Betham-Edwards, beth'am.
Bethany, beth'*a*-ni.
Bethel, beth'*e*l.
Bethesda, be-thez'd*a* *or* be-thes'd*a*.
Beth-horon, beth-hō'ron.
Bethlehem, beth'lē-hem *or* beth'lē-*e*m.
Bethlen, bet'len.
Bethphage, beth'f*a*-jē; *often as Eng.*, beth'fāj.
Bethsaida, beth-sā'i-d*a*.
Beth-shemesh, beth-shē'-mesh.
Bethune, *French* bā-tün'; *Amer.* bē-thōōn'.
Betony, bet'ō-ni.
Betsiboka, bet-si-bō'kä.
Betsileo, bet-si-lā'ō.
Bettelheim, bet'*el*-hīm.
Bettia, be-tē'*a*.
Bettinelli, bet-tē-nel'lē.
Betto, bet'tō.
Bettws-y-Coed, bet'ōōs-i-kō'ed *or* -koid'.
Betul, bā-tōōl'.
Betwa, bet'wä.
Beule, bûl.
Beust, boist.
Beuthen, boi't*e*n.
Beveland, bā'v*e*-länt.
Beveridge, bev'*e*r-ij.
Beveziers, bā-v'-zyâr'.
Bevis, bē'vis.
Bewick, bū'ik.
Beyle, bāl.
Beyrich, bī'ri*ch*.
Beyschlag, bī'shläK.
Beza, bē'z*a*.
Bezant, bē-zant'.
Béziers, bā-zyā'.
Bézique, bā-zēk'.
Bezoar, bē'zōr.
Bezwada, bez-wä'd*a*.
***Bhavagad Gita**, bag'*a*-vad gē't*a*.
***Bhagavatapurana**, bä'-g*a*-vat-*a*-pōō-rä'n*a*.
***Bhagirathi**, bä-gē-rä'tē.
***Bhainsror**, bīns'ror.
***Bhamo**, bä-mō'.
***Bhandara**, bun-dä'rä.
***Bhang**, bang.
***Bhanpura**, bän-pōō'rä.
***Bhartpur**, burt'pŏŏr.
***Bhartrihari**, bär'tri-har-i.
***Bhaunaghar**, bou'nug-ur.
***Bhavabhuti**, buv-*a*-bōō'-ti.
***Bhavishyapurana**, b*a*-vish'y*a*-pōō-rä'n*a*.
***Bhera**, bē'r*a*.
***Bhils**, bēlz.
***Bhilsa**, bēl's*a*.
***Bhiwani**, bē-wä'ni.
***Bhopal**, bō-pôl'.
***Bhor**, bôr.
***Bhuj**, bōōj.
***Bhusawal**, bōō-sä'w*a*l.
***Bhutan**, bōō-tän'.
***Bhuvaneswar**, bōō-v*a*-nes'wur.
Biafra, bē-äf'r*a* *or* bē-ăf'-r*a*.
Byala, byä'lä.
Biana, byä'nä.
Biancavilla, byäng-kä-vēl'-lä.
Bianchini, byäng-kē'nē.
Bianco, byäng'kō.
Biard, byär.
Biarritz, byä-rēts'.
Bias, bī'*a*s.
Biban-el-Meluk, bē-bän'-el-mā'lŏŏk.
Bibbiena, bēb-byā'nä.
Bibescu, bē-bes'kōō.
Bibiri, bē-bē'rē.
Biblia Pauperum, bib'-li-*a* pô'p*e*-rum.
Bibliothèque Nationale, bē-blē-ō-tek' nå-syō-nål'.
Bicêtre, bē-sā'tr'.
Bichat, bē-shå'.
Bickerstaffe, bik'*e*r-ståf.
Bicquette Island, bi-ket'.
Bida, bē'dä.
Bidar, bē'dur.
Bidassoa, bē-dä-sō'ä.
Biddeford, bid'i-f*e*rd.
Bideford, bid'i-f*e*rd.
Bidens, bī'denz.
Bidpai, bid'pī.
Biebrich, bē'bri*ch*.
Biel, bēl.
Biela, bē'lä.
Bielaya-Tserkov, byel'ä-yä-tser'kof.
Bielefeld, bē'l*e*-felt.
Bielgorod, byel'gō-rot.
Bieli Kliuch, byā'li klūK'.
Bielitz, bē'lits.
Biella, byel'lä.
Bielo-ozero, byel'ō-ô'zye-rō.
Bielopol, byel'o-pôl-y'.
Bielostok, byel-o-stôk'.
Bielski, byel'ski.
Bieltsi, byel'tsi.
Bien-Hoa, bi-en-hō'ä.
Bienne, byen.
Bierstadt, bēr'shtät.
Biesbosch, bēs'bos'.
Bifrost, bēf'rost.
Bigelow, big'*e*-lō.
Bignonia, big-nō'ni-*a*.
Bigorre, bē-gôr'.
Big Sioux, sōō.
Bihar, bi-här'.
Bihe, bē-ā'.
Bijapur, bē'j*a*-pŏŏr.
Bijawar, bē-jô'*e*r.
Bijnaur, bij-nour'.
Bijouterie, bē-zhōō'ter-i; *F.* bē-zhōō-t'rē'.
Bikaner, bik-*a*-nēr'.
Bikelas, bē-kā'lås.
Bikrampur, bik'rum-pŏŏr.
Bilaspur, bē-läs'pŏŏr.
Bilbao, bil-bä'ō.
Bilbilis, bil'bi-lis.
Bilderdijk, bil'd*e*r-dīk *or* -dīk'.
Bilin, bē-lēn'; *Bohem.* bē'-lēn.
Billaud-Varenne, bē-yō'-vå-ren'.
Bille, bil'*e*.
Billiton, bil-i-ton'
Billot, bē-yō'.
Billroth, bil'rōt.
Bilma, bil'mä.
Biloxi, bi-lok'si.
Bilse, bil's*e*.
Bima, bē'mä.
Bimlipatam, bim-li-pä-täm'.
Biñan, bē-nyän'.
Binary, bī'n*a*-ri.
Binche, bańsh.
Bingen, bing'*e*n.
Binger, bań-zhā'.
Bingerloch, bing'*e*r-loK.
Bingham, bing'*a*m.
Bintang, bin-tang'.
Binturong, bin'tŏŏ-rong.
Biobio, bē'ō-bē'ō.
Bion, bī'on.
Biot, b'yō.
Bir, bēr.
Birbhum, bēr-bōōm'.
Birch-Pfeiffer, bēr*ch*'pfī'-f*e*r.
Birejik, bē re-jēk'.
Birjand, bēr-jänd'.
Birkenfeld, bēr'k*e*n-felt.
Birkenhead, bûrk''n-hed.
Birnam, bûr'n*a*m.
Birney, bûr'ni.
Biron, bē'rōn; *French* bē-rôń'.
Birrell, bûr'el.
Birs, bērs.
Biru, bē'rōō.
Bisacquino, bē-säk-kwē'-nō.
Bisceglie, bē-shāl'yā.
Bischof, bish'ōf.
Bisharin, bē-shä-rēn'.
Biskra, bis'krä.
Bismarck, *Ger.* bis'märk; *tn. U. S.* biz'märk.
Bismarckburg, bis'märk-bŏŏr*ch*.
Bismarck-Schönhausen, shûn'hou-z*e*n.
Bissagos, bi-sä'gōs.
Bisschop, bis'sKop.
Bistritz, bis'trits.
Bistritz-Nazzed, näs'sed.
Bisutun, bē-sōō-tōōn'.
Bithur, bē-tōōr'.
Bithynia, bi-thin'i-*a*.
Bitlis, bit-lēs'.
Bitonto, bē-ton'tō.
Bitsch, bich.
Bitterfeld, bit'*e*r-felt.
Bitumen, bi-tū'm*e*n.
Bituriges, bi-tûr'-i-jēz
Bitzius, bit'si-ŏŏs.
Biwa Lake, bē'wä.
Bixa Orellana, bik's*a* ō-rel'*a*-n*a*.
Biysk, bēsk.
Bizerta, bē-zer't*a*.
Bizet, bē-zā'.
Björneborg, byûr'ne-bŏr'y'.
Björnson, byûrn'son.
Björnstjerna, byûrn-sher'nä.
Blackstone, blak'stōn; *in England*, -stun.
Blaeu, blou.
Blagodat, blä-go-dät'.
Blagoveshchensk, blä-go-vyesh'chensk.
Blanc, Mont, môń bläń.
Blanche, Dent, däń bläńsh.
Blankenberge, bläng'k*e*n-ber-g*e*.
Blankenburg, bläng'k*e*n-bŏŏr*ch*.
Blanqui, bläń-kē'.
Blantyre, blan-tīr'.
Blasius, blā'zi-us.
Blass, bläs.
Blavatski, blä-vät'ski.
Bleek, blāk.
Bleiberg, blī'ber*ch*.
Bleibtreu, blīp'troi.
Blekinge, blā'king-*e*.
Blemmyes, blem'i-ēz.
Blenheim, blen'im.
Blennerhasset, blen-*e*r-has'et.
Bles, bles.
Blicher, bli*ch*'*e*r.
Blida, blē'dä *or* blē-dä'.
Bligh, blī.
Blind (Karl), blint.
Bloch, bloK.
Bloemfontein, blōōm'fon-tīn'.
Blois, blwä.
Blok, blok.
Blomfield, blum'fēld *or* blōōm'fēld.
Blommaert, blom'ärt.
Blondel, blon-del' *or* blоń-del'.
Blondin, bloń-dań'; *Anglicized*, blon'din.
Bloomfield-Zeisler, tsīs'-l*e*r.
Blouet, blōō-ā'.

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* In Sanskrit and modern East Indian names *bh* is pronounced, by natives and by students of these languages, as *b* followed by a strong aspirate, somewhat as *bh* in ca*bh*orse, but the *h* is omitted in pronunciation by most English-speaking people, even in India.

Blount, blunt.

Blowitz, blō'vits.

Bloxwich, bluk'sich.

Blücher, blü*ch'e*r *or* blo͞o'k*e*r.

Blum, blo͞om.

Blumenbach, blo͞o'm*e*n-bäᴋ.

Blumenthal, blo͞o'm*e*n-täl.

Bluntschli, blo͝ont'shli.

Boabdil, bō-äb-dēl'.

Boadicea, bō-*a*-di-sē'*a*.

Boanerges, bō-*a*-nûr'jēz.

Boas, bō'äs.

Boavista, bō-ä-vēs'tä; *Port.* -vēsh'tä.

Boaz, bō'az.

Bobadilla, bō-vä-dēl'yä.

Bobbili, bob'i-li.

Bobbio, bob'byō.

Bober, bō'ber.

Bobrinets, bob-ri-nyets'.

Bobruisk, bob-ro͞o'y'sk.

Boca del Drago, bō'kä del drä'gō.

Bocaue, bō-kou'ā.

Boccaccio, bok-kät'chō.

Boccage, bō-kȧzh'.

Boccalini, bok-kä-lē'nē.

Bocca Tigris, bok'k*a* tē'gris.

Boccherini, bok-kā-rē'nē.

Bocchus, bok'us.

Bochart, bō-shär'.

Bochnia, boᴋ'nyä.

Bochold, boᴋ'ōlt.

Bocholt, boᴋ'ōlt.

Bochum, boᴋ'o͝om.

Böcking, bök'ing.

Böcklin, bök'lin.

Bocskay, boch'koi.

Bode, bō'd*e*.

Bodegas, bō-dā'gäs.

Bodenbach, bō'd*e*n-bäᴋ.

Bodensee, bō'd*e*n-zā.

Bodenstedt, bō'd*e*n-shtet.

Bodin, bō-daṅ'.

Bodinayakanur, bō-di-nä'y*a*-k*a*-no͞or'.

Bodleian, bod'li-*a*n *or* bod-lē'y*a*n.

Bodmer, bōt'm*e*r.

Bodoni, bō-dō'nē.

Boece, bois *or* bō-ēs'.

Boeckh, bök.

Boehler, bö'l*e*r.

Boehm, böm.

Boehme, bö'm*e*.

Bœhmeria, bö-mē'ri-*a*.

Boehm von Bawerk, böm' fon bä'verk.

Bœotia, bē-ō'shi-*a*.

Boerhaave, bo͞or'hä-v*e*; *Angl.* bōr'häv.

Boers, bo͞orz.

Boëtius, bō-ē'shi-us.
Boëthius, bō-ē'thi-us.

Bogardus, bō-gär'dus.

Bögh, bög.

Boghaz-Keui, bō-gäz'kû'i.

Bogo, bō'gō.

Bogodukhov, bog-o-do͞o'kof.

Bogomiles, bog'ō-mīlz.

Bogorodsk, bog-o-rodsk'.

Bogoslovsk, bog-o-slofsk'.

Bogota, bō-gō-tä'.

Bogra, bog-rä'.

Bogutschütz, bō'go͝ot-shüts.

Bohemond, bō'hē-mond.

Bohlen, bō'l*e*n.

Böhmer, bû'm*e*r.

Böhmerwald, bû'm*e*r-vält.

Böhmisch-Leipa, bû'mish-lī'p*a*.

Bohn, bōn.

Bohol, bō-hōl'.

Boiardo, bō-yär'dō.

Boieldieu, bō-yel-dyû'.

Boii, bō'i-ī.

Boileau Despréaux, bwȧ-lō' dā-prā-ō'.

Bois-Brûlés, bwä-brü-lā'.

Bois de Boulogne, bwä d*e* bo͞o-lō'ny'.

Boise, boi'zā.

Boisgobey, bwä-gō-bā'.

Bois-le-Duc, bwä-l*e*-dük'.

Boisserée, bwä-s'rā'; *Ger. pron.* boi-s*e*-rā'.

Boissier, bwä'syā'.

Boissonade, bwä-sō-nȧd'.

Boissy d'Anglas, bwä-sē' däṅ-glȧs'.

Boito, boi'tō.

Bojador, boj-*a*-dōr'; *Port. pron.*, bō-zhä-dōr'.

Boke, bō'kā.

Bokelmann, bō'k*e*l-män.

Bokhara, bō-ᴋä'rä.

Bol, bōl.

Bolama, bō-lä'm*a*.

Bolan Pass, bō-län'.

Bolaram, bō-lä'r*a*m.

Bolbec, bol-bek'.

Boldrewood, bōl'd'r-wo͝od.

Bolero, bō-lā'rō.

Bo-le'tus.

Boleyn, bo͝ol'in.

Bolgary, bol-gä'ri.

Bolingbroke, bol'in(g)-bro͝ok *or* bō'ling-brōk; formerly bo͝ol'ing-bro͝ok.

Bolintineanu, bō-lēn-tē-ne-än'.

Bolivar, bol'i-v*a*r; *Span. pron.* bō-lē'vär.

Bolivia, bō-liv'i-*a*; *Span. pron.* bō-lē'vyä.

Bolkhov, bol-ᴋôf'.

Bol'land-ists.

Bolles, bōlz.

Bologna, bō-lōn'yä.

Bologoi, bō-lō-goi'.

Bolor-tagh, bō-lôr'täg'.

Bolsena, bol-sā'nä.

Bolsover, bōl'sō-v*e*r; *locally commonly*, bou'z*e*r.

Bolton, bōl'tun.

Boma, bō'mä.

Bomarsund, bō'mär-so͝ond' *or* -so͝on'.

Bomba, bom'bä.

Bombardon, bom-bär'dun.

Bombazine, bom'b*a*-zēn *or* bum'-.

Bombetoka, bom-be-tō'k*a*.

Bom Fim, bôṅ fēṅ.

Bommelö, bom'*e*l-û'.

Bomvanaland, bom-vä'nä-länt.

Bo'na De'a.

Bonai, bō-nä'i.

Bonaire, bō-nâr'.

Bonald, bō-nȧl'.

Bonar, bon'*a*r.

Bonaventura, bō-nä-ven-to͞o'rä.

Bonchamp, bôṅ-shäṅ'.

Bonde, bon'd*e*; *pl.* bûn'd*e*r.

Bondeno, bon-dā'nō.

Bondi, bon'dē.

Bondu, bon-do͞o'.

Bonduku, bon-do͞o'ko͞o.

Bonga, bong'ä *or* boṅ-gä'.

Bon-gar'dia.

Bon Gaultier, bon gôl'ti-*e*r.

Bonghi, bong'gē.

Bongo, bong'gō; *Phil. Islds.* bong'ō.

Bonham, bon'*a*m.

Bonheur, bō-nûr'.

Boni, bō'nē.

Boniface, bon'i-fās; *Fr. pron.* bō-nē-fäs'.

Bonifacio, bō-nē-fä'chō.

Bonington, bon'ing-tun.

Bonin Islands, bō-nēn'.

Bonito, bō-nē'tō.

Bonivard, bō-nē-vär'.

Bonnat, bō-nȧ'.

Bonneval, bon-vȧl'.

Bonomi, bō-nō'mi.

Bononia, bō-nō'nyä.

Bonpland, bôṅ-pläṅ'.

Bonsignori, bon-sē-nyō'rē.

Bonstetten, bon'stet-*e*n.

Bonvalot, bôṅ-vȧ-lō'.

Bonvin, bôṅ-vaṅ'.

Bonze, bonz *or* bon'ze.

Boom, *tn. Belgium*, bōm.

Boorde, Borde, bōrd.

Boötes, bō-ō'tēz.

Booth, bo͞oth (*not* bo͞oᴛʜ).

Boothby, bo͞oᴛʜ'bi.

Boothia Felix, bo͞o'thi-*a* fē'liks.

Bootle-cum-Linacre, bo͞o't'l-kum-lin'*a*-k*e*r.

Bo'ra.

Boracic, bō-ras'ik.

Borås, bo͞o'rōs *or* bo͞o'rôs.

Borchgrevink, bôr*ch*'gre-vingk.

Borda, bôr-dȧ'.

Bordeaux, bôr-dō'.

Bordelais, bôr-d'lā'.

Bordereau, bôr-d'rō'.

Bordighera, bôr-dē-gā'rä.

Bordone, bôr-dō'nā.

Bo're-as.

Bore'cole'.

Borelli, bō-rel'lē.

Borga, bôr'go.

Borgerhout, bôr'g*e*r-hout.

Borghese, bôr-gā'sā.

Borghesi, bôr-gā'sē.

Borgia, bôr'jä.

Borgne, bôrn.

Borgo, bôr'gō.

Borgognone, bôr-gō-nyō'nā.

Borgomanero, bôr-gō-mä-nā'rō.

Borgu, bôr-go͞o'.

Boris Godunov, bō'ris god-o͞o-nôf'.

Borisoglyebsk, bor-ē-so-glyepsk'.

Borisov, bo-rē'sof.

Borisovka, bō-rē-sof'kä.

Börjesson, bûr'yes-on.

Borkum, bôr'ko͝om.

Borlase, bôr'lās.

Bormann, bôr'män.

Bormio, bôr'myō.

Börne, bûr'n*e*.

Bornholm, born'holm.

Bornu, bôr-no͞o'.

Boro-Budur, bō'rō-bo͞o-do͞or'.

Borodino, bor-o-dyē-nô'; *commonly Anglicized*, bor-ō-dē'nō.

Bororos, bō-rō'rōs.

Borromean Islands, bor-rō-mē'*a*n *or* -mā'*a*n.

Borromeo, bôr-rō-mā'ō.

Borrowstounness, bur-u-stō-nes'; *commonly abbreviated*, bō-nes'.

Borsna, bôrz'nä *or* bôrz-nä'.

Borsod, bōr'shōd.

Borszek, bōr'sāk.

Bory de Saint Vincent, bō-rē' d*e* saṅ vaṅ-säṅ'.

Boryslaw, bō'rē-släf *or* bō-ris'läf.

Borysthenes, bō-ris'thi-nēz.

Borzhom, bōr-zhom'.

Borzoi, bôr'zoi.

Bosboom-Toussaint, bos'bōm-to͞o-saṅ'.

Boscán-Almogaver, bōs-kän'äl-mō-gä-vâr'.

Boscawen, bos'k*a*-wen.

Bosch, bos.

Bosco Reale, bos'kō rā-ä'lā.

Boscovich, bos'kō-vich.

Bosio, bō'zyō.

Bosjesman, bos'yes-m*a*n.

Bosna, bos'nä *or* boz'n*a*.

Bosna Serai, bos'nä ser-ī'.

Bosnia, boz'ni-*a*.

Bosporus, bos'pō-rus.

Bosquet, bos-kā'.

Bosruck, bos'ro͝ok.

Bossuet, bo-swā'.

Bossut, bo-sü′.
Boström, bō′strûm.
Boswell, boz′wel.
Böszörmény, bûs′ûr-mān-y’.
Both, bôt.
Botha, bō′tä.
Bothnia, both′ni-*a*.
Both′ri-o-ceph′a-lus.
Botocudos, bō-tō-ko͞o′dōz.
Botoné, bot′ō-nā.
Botoşani, bō-tō-shä′ni *or* -shä′ny’.
Botrychium, bō-trik′i-um.
Botta, bot′tä.
Bottesini, bot-tā-zē′nē.
Botticelli, bot-tē-chel′lē.
Böttiger, bût′ē-g*e*r.
Bottini, bot-tē′nē.
Bottrop, bot′rop.
Boucher, bo͞o-shā′.
Boucher Crevecœur de Perthes, krev-kûr′ d*e* pert.
Bouches-du-Rhône, bo͞osh′-dü-rōn′.
Boucicault, bo͞o-sē-kō′ *or* bo͞o′si-kō.
Boudinot, bo͞o′di-not.
Boufarik, bo͞o-fä-rēk′.
Boufflers, bo͞o-flâr′.
Bougainville, bo͞o-gaṅ-vēl′.
Bougainvillea, bo͞o-gin-vi-lē′*a*; *commonly* -vil′i-*a*.
Boughton, bô′tun.
Bougie, bo͞o-zhē′.
Bouguer, bo͞o-gā′.
Bouguereau, bo͞o-g’rō′.
Bouillé, bo͞o-yā′.
Bouilly, bo͞o-yē′.
Boulainvilliers, bo͞o-laṅ-vē-yā′.
Boulanger, bo͞o-läṅ-zhā′.
Boulay de la Meurthe, bo͞o-lā′ d’ lä mûrt′.
Boulevard, bo͞ol′*e*-värd; *Fr. pron.* bo͞o-l’vär′.
Boulger, bōl′j*e*r.
Boulimia, bo͞o-lim′i-*a*.
Boulogne-sur-Mer, bo͞o-lō′ny’-sür-mâr′.
Boulogne-sur-Seine, sān′.
Boulton, bōl′tun.
Bouquet, bo͞o-kā′.
Bourbaki, bo͞or-bä′kē.
Bourbon, bo͞or′bun; *Fr. pron.* bo͞or-bôṅ′.
Bourbonne-les-Bains, bo͞or-bon′lā-baṅ′.
Bourboule, La, lä bo͞or-bo͞ol′.
Bourchier, bou′ch*e*r.
Bourdaloue, bo͞or-dä-lo͞o′.
Bourdon de l’Oise, bo͞or-dôṅ′ d*e* lwäz′.
Bourg-en-Bresse, bo͞or-käṅ-bres′.
Bourgeois, *Fr. pron.* bo͞or-zhwä′; *Eng.* (type, etc.) bur-jois′.
Bourgeoisie, bo͞or-zhwä-zē′.
Bourges, bo͞orzh.
Bourget, bo͞or-zhā′.
Bourguignons, bo͞or-gē-nyôṅ′.
Bourignon, bo͞o-rē-nyôṅ′.
Bourinot, bo͞o′rē-nō.
Bourke, bûrk.
Bourmont, bo͞or-môṅ′.
Bourne, bo͞orn *or* born.
Bournemouth, born′-muth *or* bo͞orn′muth.
Bourrienne, bo͞o-ryen′.
Bourse, bo͞ors; *Ger. form* **Börse,** bûr′s*e*.
Bouscat, bo͞os-kȧ′.
Boussa, bo͞o′sä.
Boussingault, bo͞o-saṅ-gō′.
Boussu, bo͞o-sü′.
Bouterwek, bo͞o′t*e*r-vek.
Bouts, bouts.
Bouts-rimés, bo͞o-rē-mā′.
Boutwell, bout′wel.
Bouvardia, bo͞o-vär′di-*a*.
Bowdich, bou′dich.
Bowpitch, bou′dich.
Bowdler, boud′l*e*r.
Bowdoin, bō′d’n.
Bowen, bō′en.
Bowie-knife, bō′i *or* bo͞o′i.
Bowles, bōlz.
Bowman, bō′m*a*n.
Bowness, bō-nes′.
Bowring, bou′ring.
Bowyer, bō′y*e*r.
Boxhagen-Rummelsburg, boks′hä-g*e*n-ro͝om′*e*ls-bo͝orch.
Boyacá, bō-yä-kä′.
Boyar, bō-yär′.
Boyer, bwȧ-yā′.
Boyesen, boi′*e*-s*e*n.
Bozeman, bōz′m*a*n.
Bozen, bō′ts*e*n.
Bozrah, boz′rä.
Bozzaris, bōt′sä-rēs; *popularly,* bō-zar′is.
Bra, brä.
Brabançonne, La, lä brä-bäṅ′son.
Brabant, brä′bänt′ *or* brä-bänt; *Fr. pron.* brȧ-bäṅ′.
Brac, brȧk.
Bracara Augusta, brä-kä′-rä ou-go͞os′tä.
Bracciano, brät-chä′nō.
Braccio, brät′chō.
Bracciolini, brät-chō-lē′nē.
Brachial, brak′i-*a*l *or* brā′-ki-*a*l.
Brachiopoda, brak-i-op′ō-d*a* *or* brak-i-ō-pō′d*a*.
Brachycephalic, brak-i-se-fal′ik.
Brachyura, brak-i-ū′r*a*.
Brackenridge, brak′*e*n-rij.
Bracteates, brak′ti-āts′.
Brading, brā′ding.
Bradlaugh, brad′lô.
Bradwardine, brad′wär-din.
Brady, brā′di.
Bradycardia, brad-i-kär′ di-*a*.
Bradypus, brad′i-pus.
Braemar, brā-mär′.
Braga, brä′gä.
Bragança, brä-gäṅ′sä.
Bragi, brä′gē.
Braham, brā′*a*m.
Brahe, brā *or* brä; *Danish pron.* brä′ĕ.
Brahma, brä′mä.
Brahmanas, brä′m*a*-n*a*.
Brahmanbaria, brä-m*a*n-bä′ri-ä.
Brahmani, brä′m*a*-nē.
Brahmanism, brä′m*a*n-iz’m.
Brahmapurana, brä-m*a*-po͞o-rä′n*a*.
Brahmaputra, brä-m*a*-po͞o′-tr*a*.
Brahma Samaj, s*a*-mäj′.
Brahms, bräms.
Brahui, brȧ-ho͞o′ī.
Braila, brä-ē′lä.
Braille, brȧ′y’; *Eng. pron.* brāl.
Brainard, brān′*a*rd.
Braine-le-Comte, brān′l*e*-kôṅt′.
Bramah, *properly* bram′*a*; *commonly,* brä′m*a* *or* brā′m*a*.
Bramante, brä-män′tā.
Bramantino, brä-män-tē′-nō.
Brambanan, bräm-bä′nän.
Branchiæ, brang′ki-ē.
Branchidæ, brang′ki-dē.
Branco, bräng′kō.
Brancovan, bräng′kō-vän.
Brande, brand.
Brandeis, brän′dīs.
Brandenburg, brän′d*e*n-bo͝or*ch*.
Brandes, brän′des.
Brandis, brän′dis.
Brandl, brän′d’l.
Brandt, bränt.
Brantôme, bräṅ-tōm′.
Bras d’Or, brä dor′.
Brasenia, bra-sē′ni-*a*.
Brasidas, bras′i-das
Brasseur de Bourbourg, brä-sûr′ d*e* bo͞or-bo͞or′.
Brassica, bras′i-k*a*.
Brassó, bräsh′shō.
Bratianu, brä-ti-än′.
Bratsberg, bräs-bâr′y’.
Brattleboro, brat′’l-bur-ō.
Braun, broun.
Braunsberg, brouns′ber*ch*.
Braunschweig, broun′-shvī*ch*.
Brava, brä′vä.
Bravura, brä-vo͞o′rä.
Brazos, brä′zōs.
Brazza, brät′sä.
Breadalbane, bred-al′bān.
Breccia, bret′ch*a*.
Brechin, brē′ᴋin *or* breᴋ′in.
Brecknock, brek′nok.
Breda, brā-dä′.
Bredahl, brā-däl′.
Brederode, brā′d*e*-rō′d*e*.
Brederoo, brā′d*e*-rō′.
Bredow, brā′dō.
Brée, brā.
Breeches Bible, brich′ez *or* brēch′ez.
Bregenz, brā-gents′.
Brehm, brām.
Brehon Laws, brē′hon.
Breisgau, brīs′gou.
Breitenfeld, brī′t*e*n-felt.
Breitkopf, brīt′kopf.
Breitmann, Hans, häns brīt′män.
Bremen, brā′m*e*n.
Bremer, brā′m*e*r.
Bremerhaven, brā′m*e*r-hä′f*e*n; *Eng. pron.* brem′-m*e*r-hā′v*e*n.
Brendan, bren′d*a*n.
Breneman, bren′*e*-m*a*n.
Brenham, bren′*a*m.
Brenner, bren′*e*r.
Brennus, bren′us.
Brenta, bren′tä.
Brentano, bren-tä′nō.
Brenz, brents.
Brescia, bresh′ä.
Breslau, bres′lou.
Brest, brest.
Brest Litovsk, lyē-tôfsk′.
Bretagne, bret-än′y’.
Bretigny, bret-ēn-yē′.
Breton (Cape), brit′un *or* bret′un; *Fr.* bret-ôṅ′.
Bretón de los Herreros, brā-tōn′ dā lōs er-rā′rōs.
Bretschneider, bret′shnī-d*e*r.
Breughel, brû*ch*′*e*l.
Brévent, brā-väṅ′.
Brevet, bre-vet′.
Brevier, bre-vēr′.
Brézova, brā′zō-vȧ.
Brialmont, brē-ȧl-môṅ′.
Briançon, brē-äṅ-sôṅ′.
Briansk, brē-änsk′.
Brianza, brē-än′dzä.
Briare, brē-är′.
Briareus, brī-ā′rē-us *or* brī′*a*-rūs.
Bridlington, *usually* bûr′-ling-tun.
Brieg, brē*ch*.
Briel, brēl; *Fr.* **Brielle,** brē-el′.
Brienne, brē-en′.
Brienne le Chateau, l*e* shȧ-tō′.
Brienz, brē-ents′.
Brierley, brī′*e*r-li.
Brieux, brē-û′.

Brigandine, brig′*a*n-din *or* -dīn.
Brigantes, bri-gan′tēz.
Brigham, brig′*a*m.
Brighella, brē-gel′lä
Brigit, brij′it.
Brignoli, brē-nyō′lē.
Brigue, brēg.
Bril, brēl.
Brillat-Savarin, brē-yȧ′sȧ-vȧ-raṅ′.
Brin, brēn.
Brinckman, bringk′män.
Brindaban, brin-d*a*-bun′.
Brindisi, brēn′dē-zē.
Brinkerhoff, bring′k*e*r-hof.
Brinvilliers, braṅ-vē-yā′.
Brionian Islands, brī-ō′ni-*a*n.
Brisbane, briz′bān; *colloq.* briz′b*a*n.
Briseis, brī-sē′is.
Brisson, brē-sôṅ′.
Brissot, brē-sō′.
Bristow, bris′tō.
Britannicus, bri-tan′ī-kus.
Britomartis, brit-ō-mär′tis.
Brive, brēv.
Brixen, briks′*e*n.
Brixham, briks′*a*m.
Brixiegg, briks′i-eg.
Bri-za.
Broca, brō-kȧ′.
Broccoli, brok′ō-li.
Broch, broK.
Brochure, brō-sho͞or′.
Brockes, brok′es.
Brockhaus, brok′hous.
Broderick, brō′d*e*-rik.
Brodie, brō′di.
Brody, brô′di.
Brodzinski, brod-zin′ski.
Broglie, brō′ē-y′.
Bromberg, brom′ber*ch*.
Bromeliaceæ, brō-mel-i-ā′si-ē.
Bromine, brō′min *or* brō′mēn.
Bromley, brum′li.
Bromsgrove, brumz′grōv.
Bromwich, brum′ich.
Bronchi, brong′kī.
Bröndsted, brûn′sted.
Brongniart, brôṅ-nyär′.
Bronte, bron′tā.
Brontë, bron′tā.
Brontotheriidæ, bron-tō-the-rī′i-dē.
Bronzino, bron-dzē′nō.
Brooch, brōch *or* bro͞och.
Brookline, bro͝ok′līn.
Brosböll, bros-bûl′.
Broschi, brō′skē.
Brough, bruf.
Brougham, bro͞om, bro͞o′*a*m, *or* brō′*a*m.
Broughton, brou′tun.
Broughty-Ferry, brô′ti.
Broussais, bro͞o-sā′.
Brouwer, brou′*e*r.
Brownell, brou-nel′.
Brown-Séquard, broun-sā-kär′.
Bruay, brü-ā′.
Brucea, bro͞o′si-*a*.
Bruch, bro͝oK.
Bruchsal, bro͝oK′zäl.
Brucine, bro͞o′sin *or* bro͞o′sēn.
Brucker, bro͝ok′*e*r.
Brückner, brük′n*e*r.
Brudenell, bro͞o′d*e*-nel.
Brüdergemeinde, brü′d*e*r-g*e*-mīn′d*e*.
Brüderhof, brü′d*e*r-hōf.
Brueys, brü-es′.
Bruges, bro͞o′jiz; *Fr. pron.* brüzh.
Brugsch, bro͞oKsh.
Bruhl, bro͞ol.
Brulov, bro͞o′lof.
Brumaire, brü-mâr′.
Brunanburh, bro͞o′n*a*n-bo͝orK.
Brunck, bro͞ongk.
Brun-du′si-um.
Brune, brün.
Brunei, bro͞o-nī′.
Brunel, bro͞o-nel′; *F. pron.* brü-nel′.
Brunelleschi bro͞o-nel-les′kē.
Brunetière, brün-tyâr′.
Brunhilda, bro͝on-hil′dä.
Bruni, *Ital.* bro͞o′nē; (*island*) bro͞o-nī′.
Brünig Pass, brü′ni*ch*.
Brünn, brün.
Brunne, brun.
Brunnen, bro͝on′*e*n.
Brunner, bro͝on′*e*r.
Brünnow, brü′nō.
Brunsbuttel, bro͝ons′bo͝ot-*e*l.
Brusa, bro͞o′sä.
Brütt, brüt.
Brut′ti-um.
Brüx, brüks.
Bruxelles, brü-sel′ *or* brüks-el′.
Bry, brē.
Bryansk, bryänsk.
Brydges, brij′iz.
Bryennios, brē-en′ni-os.
Bryn Mawr College, brin mär′.
Bryony, brī′ō-ni.
Bryozoa, brī-ō-zō′*a*.
Bryum, brī′um.
Brzesc, bzheshtsh.
Brzezany, bzhe-zhä′ni.
Buache, bü-äsh′.
Bubastis, bū-bas′tis.
Bubonic Plague, bū-bon′ik.
Bucaramanga, bo͞o-kä-rä-mäng′gä.
Buccinator, buk′si-nā-t*e*r.
Buccinum, buk′si-num.
Buccleuch, buk-klo͞o′.
Bucentaur, bū-sen′tôr.
Bucephala, bū-sef′*a*-l*a*.
Bucephalus, bū-sef′*a*-lus.
Bucer (*Lat form.*), *Ger. pron.* bo͞ot′ser; *Eng. pron.* bū′s*e*r; *Ger. form,* **Butzer,** bo͞ot′s*e*r.
Buch, bo͞oK.
Buchan, buK′*a*n.
Buchanan, buk-an′*a*n *or* bū-kan′*a*n.
Buchanites, buk′*a*n-īts
Buchan Ness, buK′*a*n nes′.
Bucharest, bo͞o-k*a*-rest′.
Bucher, bo͞oK′*e*r.
Buchez, bü-shā′.
Büchner, bü*ch*′n*e*r.
Buchtel College, buk′tel.
Buckingham, buk′ing-*a*m.
Budæus, bū-dē′*us*; *Fr. form,* **Budé,** bü-dā′.
Budapest, bo͞o′dä-pest′; *Hung. pron.* -pesht.
Budaun, bo͞o-dä-o͞on′.
Buddha, bo͝od′ä.
Buddh Gaya, gä′yā.
Buddhism, bo͝od′iz′m.
Budgerigar, buj′*e*r-i-gär′.
Budissin, bo͞o′dis-sin.
Budrum, bo͝od-ro͞om′.
Budur, bo͝o-do͞or′.
Budweis, bo͞ot′vīs.
Buell, bū′el.
Buenaventura, bwā′nā-ven-to͞o′rä.
Buenavista, bwā-nä-vēs′tä.
Buen Ayre, bwen ī′rā.
Buenos Ayres, *Sp. pron.* bwā′nōs ī′rās.
Buer, bo͞or.
Buffon, buf′un; *F. pron.* bü-fôṅ′.
Buford, bū′f*e*rd.
Buga, bo͞o′gä.
Bugasón, bo͞o-gä-sōn′.
Bugeaud de la Piconnerie, bü-zhō′ d′lȧ pē-kōn-rē′.
Bugenhagen, bo͞o′g*e*n-hä′g*e*n.
Bugge, bo͞og′*e*.
Buguruslan, bo͞o′go͝o-ro͝os-län′.
Buhi, bo͞o′hē.
Buhl work, bo͞ol *or* būl.
Buhrstone, bûr′stōn.
Buitenzorg, boi′t*e*n-zor*ch*′.
Bukhara, bo͝o-Kä′rä.
Bukharest, bo͞o-kä-rest′.
Bukkefjord, bo͝ok′*e*-fyôr.
Buknfiord, bo͝ok′′n-fyôr.
Bukowina, bo͞o-kō-vē′nä.
Bulacán, bo͞o-lā-kän′.
Bulan, bo͞o′län.
Bulandshahr, bo͞o-l*a*nd-shä′h′r.
Bulbul, bo͝ol′bo͝ol.
Buldana, bo͝ol-dä′nä.
Bulfinch, bo͝ol′finch.
Bulgaria, bo͝ol-gā′ri-*a*.
Bulgarin, bo͝ol-gä′rin.
Bulkeley, bulk′li.
Bullen, bo͝ol′en.
Buller, bo͝ol′*e*r.
Bullinger, bo͝ol′ing-*e*r.
Bulnes, bo͝ol′nās.
Bülow, bü′lō.
Bulsar, bul-sär′.
Bulthaupt, bo͝olt′houpt.
Bulti, bul′tē.
Buluwayo, bo͞o-lo͝o-wä′yō.
Bulwer, bo͝ol′w*e*r.
Buncombe, bung′kum.
Bundelkhand, bun-del-kund′.
Bunder, or **Bandar, Abbas,** bun′d*e*r äb′bäs.
Bundesrath, bo͝on′des-rät.
Bundheim, bo͝ont′hīm.
Bundi, bo͞on′dē.
Bunsen, bo͝on′s*e*n.
Bunter, bo͝on′t*e*r.
Bunzlau, bo͝onts′lou.
Buol-Schauenstein, bo͞o′ōl-shou′*e*n-shtīn.
Buonaparte, bō′n*a*-pärt; *It.* bwō-nä-pär′tā.
Buonarroti, bwō-nār-rō′tē.
Buonvicino, bwōn-vē-chē′nō.
Buoy, boi.
Buoyancy, boi′*a*n-si.
Buprestis, bū-pres′tis.
Burbage, bûr′bij.
Burchiello, bo͝or-kyel′lō.
Burckhardt, bo͝ork′härt, *Eng.* bûrk′härt.
Burdekin, bûr′di-kin.
Burdett, bûr-det′.
Burdett-Coutts, bûr-det′-ko͞ots′ *or* bûr′det.
Burdette, bûr-det′.
Burdwan, bûrd-wān′.
Bure, būr.
Bureaucracy, bū-rō′kr*a*-si *or* bū-rok′r*a*-si.
Buren, bū′r*e*n.
Burette, bo͝o-ret′.
Burg, bo͝or*ch*.
Burgas, bo͝or′-gās′.
Burgdorf, bo͝or*ch*′dôrf.
Burgee, bûr′jē.
Bürger, bür*ch*′*e*r.
Burger, bo͝or′g*e*r.
Burgers, bo͝or′g*e*rs.
Burgess, bûr′jes.
Burghers, bûrg′*e*rz.
Burghley, bûr′li.
Burgkmair, bo͝or*ch*′mīr.
Burgos, bo͝or′gōs.
Burgoyne, bûr-goin′.
Burgrave, bûr′grāv.
Burgundii, bûr-gun′di-ī.
Burgundy, bûr′gun-di.
Burhanpur, bo͝or-hän′po͝or.
Burias, bo͞o′rē-äs.
Buriats, bo͞o′ri-äts.

Buridan, bûr′i-d*a*n; *Fr.* bü-rē-däṅ′.

Burin, bū′rin.

Buriti, bo͞o-rē′tē.

Burleigh, bûr′li.

Burlingame, bûr′ling-gām.

Burlus, bo͝or′lus.

Burmann, bur′män.

Burmeister, bo͝or′mīs-t*e*r.

Burnaby, bûr′n*a*-bi.

Burnand, bûr′n*a*nd.

Burne-Jones, bûrn′jōnz′.

Burnell, bûr′nel.

Burnes, bûrnz.

Burnet, bûr′net.

Burnett, bûr-net′.

Burnouf, bür-no͞of′.

Burntisland, bûrnt-ī′l*a*nd; *locally, commonly* brunt-ī′l*a*nd.

Burra, bur′*a*.

Burrage, bûr′ij.

Burrard Inlet, bur′ärd.

Burrell, bûr′el.

Burriana, bo͝or-rē-ä′nä.

Bursar, bûr′sär.

Burschenschaft, bo͝orsh′*e*n-shäft.

Bursitis, bûr-sī′tis.

Burslem, bûrs′lem.

Burstenbinder, bo͝or′st*e*n-bin-d*e*r.

Burtscheid, bo͝ort′shīt.

Buru, bo͞o′ro͞o.

Burujird, bo͞o-ro͞o-jērd′.

Bury, ber′i.

Busa, bo͞o′sä.

Busby, buz′bi.

Busch, bo͝osh.

Büsching, büsh′ing.

Buschmann, bo͝osh′män.

Bushire, bo͞o-shēr′.

Busiris, bū-sī′ris.

Buskerud, bo͝os′ke-ro͝od.

Busra, bus′r*a*.

Bussa, bo͝os′ä.

Bussanga, bo͝o-säng′gä.

Bussey, bus′i.

Bussora, bo͝os′ō-rä.

Busto Arsizio, bo͞os′tō är-sēd′zi-ō.

Busuanga, bo͝o-swäng′ä.

Butan, bo͝o-tän′.

Butane, bū′tān.

Bute, būt.

Butea, bū′tē-*a*.

Buto, bū′tō.

Butomus, bū′tō-mus.

Butte, būt.

Butúan, bo͝o-to͞o′än.

Buturlinovka, bo͝o-to͞or-lē-nōf′kä.

Butyl, bū′til.

Butyric, bū-tir′ik.

Buxar, buks-är′.

Buxtorf, bo͝oks′tôrf.

Buys-Ballot, bois-bȧ-lō′.

Buzeu, bo͝o′z*e*-o͝o.

Buzuluk, bo͝o-zo͝o-lo͝ok′.

Byblos, bĭb′los.

Byker, bī′k*e*r.

Bylazora, bil-*a*-zō′r*a*.

Bylini, bi-lē′nē.

Byng, bing.

Byrd, bûrd.

Byrgius, bûr′ji-us.

Byrlaw, bir′lô.

Byrnie, bûr′ni.

Byssus, bis′us.

Byström, bü′strûm.

Byzantine, bi-zan′tin *or* bĭz′*a*n-.

Byzantium, bi-zan′shi-um.

Caaba, kä′*a*-b*a*.

Caacaté, kä-ä-kä-tā′.

Caacatí, kä-ä-kä-tē′.

Caa′ing Whale, kô′ing *or* kä′ing.

Caazapá, kä-ä-sä-pä′.

Cabal, k*a*-bal′.

Caballero, kä-väl-yā′rō.

Cabanatúan, kä-vä-nä-to͞o′än.

Cabanel, kȧ-bȧ-nel′.

Cabanis, kä-bȧ-nēs′.

Cabatúan, kä-vä-to͞o′än.

Cabbala, kab′*a*-l*a*.

Cabeiri, k*a*-bī′rī.

Cabes, kä′bes.

Cabet, kȧ-bā′.

Cabinda, kä-bēṅ′dä.

Cabiri, k*a*-bī′rī.

Cabot, kab′ut.

Cabra, kä′brä.

Cabral, kä-bräl′.

Cabrera, kä-brā′rä.

Cabul, kä′bo͝ol *or* kä-bo͞ol′.

Cabúyao, kä-vo͞o′yä-ō.

Cacao, k*a*-kā′ō.

Caccini, kät-chē′nē.

Cáceres, kä′thā-rās.

Cachalot, kash′*a*-lot.

Cachar Plains, k*a*-chär′.

Cache, kȧsh.

Cacheo, kȧ-shā′ō.

Cachet, kȧ-shā′.

Cachexia, ka-kek′si-*a*.

Cachoeira, kä-shwā′ē-rä.

Cacholong, kash′ō-long.

Cacique, kȧ-sēk′.

Cacodæmon, kak-ō-dē′mon.

Cacodyl, kak′ō-dil.

Cacomistle, kak′ō-mis′l.

Cacus, kā′kus.

Cada Mosto, kä′dä mos′tō.

Cadell, kā-del′.

Cadenabbia, kä-dā-näb′-byä.

Cadenus, k*a*-dē′nus.

Cadenza, k*a*-den′z*a*; *It.* kä-dānt′sä.

Cader Idris, kad′*e*r id′ris.

Cadi, kä′dē, kā′di.

Cadillac, *tn. U. S.* kad′i-lak; *Fr.* kȧ-dē-yȧk′.

Cadiz, *tn. U. S.* kad′iz; *tn. Spain* kā′diz, *Sp.* kä′dēth.

Cadmium, kad′mi-um.

Cadogan, k*a*-dug′*a*n.

Cadoudal, kȧ-do͞o-dȧl′.

Cadoxton, k*a*-duks′tun.

Caduceus, k*a*-dū′si-us.

Cæcilius Statius, sē-sil′i-us stā′shi-us.

Cæcum, sē′kum.

Cædmon, kad′mun.

Caen, käṅ; *Eng.* kā′en.

Cære, sē′rē.

Caerlaverock, kär-lav′*e*-ruk.

Caerleon, kär-lē′un.

Caermarthen, kär-mär′-TH*e*n.

Caerwent, kär′went.

Cæsalpinia, ses-al-pin′i-*a* *or* sez-.

Cæsalpinus, ses-al-pī′nus.

Cæsarea, ses-*a*-rē′*a* *or* sez-.

Cæsarean, sē-zā′ri-*a*n.

Cæsena, sē-sē′n*a*.

Cæsium, sē′zi-um.

Café, kȧ-fā′.

Caffeine, kȧ-fē′in.

Caffraria, kä-frā′ri-*a*.

Cagayán, kä-gä-yän′.

Cagli, käl′yē.

Cagliari, käl-yä′rē.

Cagliostro, käl-yōs′trō.

Cagnola, kän-yō′lä.

Cagots, kȧ-gō′.

Caguas, kä′gwäs.

Cahors, kȧ-ôr′.

Caibarién, kī-bä-rē-ān′.

Caicos, kī′kōs.

Cailliaud, kȧ-yō′.

Caiman, kā′m*a*n.

Cainites, kān′īts.

Ça ira, sä′ ē-rä′.

Caird, kârd.

Cairn, kârn *or* kārn.

Cairnes, kârnz *or* kārnz.

Cairngorm, kârn′gōrm′ *or* kārn′-.

Cairns, kârnz *or* kārnz.

Cairo, *tn. U. S.* kā′rō; *tn. Egypt* kī′rō.

Cairoli, kī-rō′lē.

Caisson, kā′sun.

Caithness, kāth′nes.

Caius, kēz; *Lat.* kā′yus.

Caivano, kī-vä′nō.

Caix, kä-ēks.

Cajabamba, kä-hä-bäm′bä.

Cajamarca, kä-hä-mär′kä.

Cajatambo, kä-hä-täm′bō.

Cajeput Tree, kaj′*e*-put.

Cajetan, kaj′*e*-tan.

Calabar, kal′*a*-bär.

Calabria, ka-lā′bri-*a*; *It.* kä-lä′brē-ä.

Caladium, ka-lā′di-um.

Calafatu, kä-lä-fät′.

Calahorra, kä-lä-ō′rä.

Calais, *tn. U. S.* kal′is; *Fr.* kȧ lā′.

Calamander, kal′*a*-man-d*e*r.

Calamba, kä-läm′bä.

Calame, kȧ-lȧm′.

Calamianes, kä′lä-mē-ä′-nās.

Calamine, kal′*a*-min *or* -mīn.

Calamy, kal′*a*-mi.

Calandrinia, kal-*a*n-drin′-i-*a*.

Calanthe, ka-lan′thē.

Calapán, kä-lä-pän′.

Calarasi, kä-lä-rä′sē.

Calas, kȧ-läs′.

Calasiao, kä-lä-sē-ä′ō.

Calatafimi, kä-lä′tä-fē′mē.

Calatayud, kä-lä-tä-yo͞oth′.

Calaveras, kä-lä-vā′räs.

Calbáyog, käl-bä′yōg.

Calcaire Grossier, kȧl-kâr′ grō-syā′.

Calcareous, kal-kā′ri-us.

Calcasieu, käl′k*a*-sho͞o.

Calceola, kal-sē′ō-l*a*.

Calceolaria, kal′sē-ō-lā′-ri-*a*.

Calchas, kal′kas.

Calciferous, kal-sif′*e*r-us.

Calcutta, kal-kut′*a*.

Caldecott, kôl′d*e*-kut.

Caldera, käl-dā′rä.

Calderon, (P. H.) kôl′d*e*-run; *Fr.* kȧl-dā-rôṅ′.

Calderon de la Barca, kal′-d*e*-run; *Sp.* käl-dā-rōn′ dā lä bär′kä.

Calderwood, kôl′d*e*r-wo͝od.

Caldicott, kôl′di-kut.

Caldwell, kôld′wel.

Calends, kal′endz.

Calendula, k*a*-len′dū-l*a*.

Calepino, kä-lā-pē′nō.

Calgary, kal′g*a*-ri.

Calhoun, kal-ho͞on′.

Cali, kä-lē′.

Calibo, kä-lē′vō.

Calif, Califate, kā′lif, kal′-i-fāt.

Caligraphy, ka-lig′r*a*-fi.

Caligula, ka-lig′ū-l*a*.

Caliph, kā′lif.

Calippus, ka-lip′us.

Calisthenics, kal-is-then′-iks.

Calixtus, ka-liks′tus.

Calla, kal′*a*.

Callao, käl-yä′ō.

Callcott, kôl′kut.

Callias, kal′i-*a*s.

Callimachus, ka-lim′*a*-kus.

Callinus, ka-lī′nus.

Calliope, ka-lī′ō-pē.

Callisthenes, ka-lis′thi-nēz.

Callisto, ka-lis′tō.

Callistratus, ka-lis′tr*a*-tus.

Callot, kȧ-lō′.

Calluna, ka-lū′n*a*.

Calmar, kal′mär.

Calmet, kȧl-mā′.

Calochortus, kal-ō-kôr′tus.

Calomarde, kä-lō-mär′dā.

Calonne, kȧ-lon′.

Calophyllum, kal-ō-fil′um.

Caloric, k*a*-lor′ik.
Calorie, kal′ō-ri.
Calorimeter, kal-ō-rim′*e*-ter.
Calotte, kȧ-lot′.
Calottists, kȧ-lot′ists.
Calovius, ka-lō′vi-us.
Caloyers, k*a*-loi′y*e*rz.
Calpe, kal′pē.
Caltagirone, käl′tä-jē-rō′nā.
Caltanissetta, käl-tä-nis-set′tä.
Caltha, kal′th*a*.
Caltrop, kal′trop.
Caluire et Cuire, kȧl-wēr′ ā-kwēr′.
Calumba, k*a*-lum′b*a*.
Calumet, kal′ū-met.
Calumpit, kä-lo͝om-pēt′.
Calvados, kȧl-vȧ-dōs′.
Calvaert, käl′värt; *Fr.* kȧl-värt′.
Calverley, kal′v*e*r-li.
Calvert, kal′v*e*rt.
Calvinia, kal-vin′i-*a*.
Calvi Risorta, käl′vē rē-zôr′tä.
Calvo, käl′vō.
Calycanthus, kal-i-kan′thus.
Calydon, kal′i-don.
Calymene, ka-lim′*e*-nē.
Calypso, ka-lip′sō.
Calyx, kā′liks *or* kal′iks.
Camaguey, kä-mä-gwā′.
Camajore, kä-mä-yō′rā.
Camajuani, kä-mä-hwä′nē.
Camaldolites, ka-mal′dō-līts.
Camálig, kä-mä′lig.
Camaná, kä-mä-nä′.
Camargo, kä-mär′gō.
Camargue, kȧ-märg′.
Camarilla, kä-mä-rēl′yä.
Camarina, kä-mä-rē′nä.
Camarines, kä-mä-rē′nās.
Camass, kam′*a*s.
Cambacérès, käṅ-bȧ-sā-res′.
Cambay, kam-bā′.
Cambon, käṅ-bôṅ′.
Camborne, kam′bôrn.
Cambrai, käṅ-brā′.
Cambridge, kām′brij.
Cambuscan, *Chaucer*, kam′bus-kan′; *Milton*, kam-bus′k*a*n.
Cambuslang, kam′bus-lang.
Cambusnethan, kam-bus-nē′th*a*n.
Cambyses, kam-bī′sēz.
Camellia, k*a*-mel′i-*a*.
Camelopardalis, kam-*e*l-ō-pär′d*a*-lis.
Camelot, kam′*e*-lot.
Camenæ, ka-mē′nē.
Camera Lucida, kam′*e*-r*a* lū′si-d*a*.
Camera Obscura, ob-skū′r*a*.
Camerarius, kä-mā-rä′rē-o͝os.
Camerino, kä-mā-rē′nō.
Camerlengo, kam-*e*r-leng′gō; *It.* kä-mer-len′gō.
Cameron, kam′*e*-run.
Cameronians, kam-e-rō′ni-*a*nz.
Cameroon, kä-mā-ro͞on′.
Camiguín, kä-mē-gēn′.
Camiling, kä-mē-ling′.
Camillus, ka-mil′us.
Camisards, kam′i-zärdz.
Camoëns, kam′ō-ens.
Camomile, kam′ō-mīl.
Camorra, kä-mor′rä.
Campagna, käm-pän′yä.
Campan, käṅ-päṅ′.
Campanella, käm-pä-nel′lä.
Campanha, käm-pän′yä.
Campania, *It.* käm-pä′nyä; *Lat.* kam-pā′ni-*a*.
Campanile, käm-pä-nē′lā.
Campanology, kam-p*a*-nol′ō-ji.
Campanula, kam-pan′ū-l*a*.
Campanularia, kam-pan-ū-lā′ri-*a*.
Campas, käm′päs.
Campbell, kam′*e*l *or* kam′b*e*l.
Campe, käm′p*e*.
Campeachy, kam-pē′chi.
Campeggio, käm-ped′jō.
Camper, käm′p*e*r.
Camperdown, kam-p*e*r-doun′.
Camphausen, kämp′hou-z*e*n.
Camphene, kam′fēn.
Camphine, kam′fin *or* -fēn.
Camphuysen, kämp′hoi-z*e*n.
Campi, käm′pē.
Campi Bisenzio, käm′pē bē-zent′sē-ō.
Campidano, käm-pē-dä′nō.
Campinas, käṅ-pē′näsh.
Campine, kȧm-pēn′.
Campion, kam′pi-un.
Campi Raudii, kam′pī rô′di-ī *or* käm′pē rou′di-ē.
Campoamor y Campoosorio, käm-pō-ä-mōr′ ē käm-pō-ō-sō′rē-ō.
Campobasso, käm-pō-bäs′sō.
Campobello, kam-pō-bel′ō.
Campodea, kam-pō′di-*a*.
Campo Formio, käm′pō fôr′mē-ō.
Campomanes, käm-pō-mä′nās.
Campos, käṅ′po͝osh.
Campo Santo, käm′pō sän′tō.
Campulung, käm-po͝o-lo͞ong′.
Campus Martius, kam′pus mär′shi-us *or* -shus.
Camtoos, käm-tōs′.
Camuccini, kä-mo͝ot-chē′nē.
Camus, kȧ-mü′.
Cana, kä′nä.
Canaan, kā′n*a*n.
Canajoharie, kan-*a*-jō-har′i.
Canaletto, kä-nä-let′tō.
Canandaigua, kan-*a*n-dā′gw*a*.
Cañar, kän-yär′.
Canara, kä′n*a*-r*a*.
Canarium, k*a*-nā′ri-um.
Canastota, kan-*a*s-tō′t*a*.
Canaveral, ka-nav′*e*r-*a*l.
Cancionero, kän-thē-ō-nā′rō.
Candaba, kän-dä′vä.
Candace, kan′d*a*-sē.
Candahar, kän-d*a*-här′.
Candeish, kän-dāsh′.
Candelabrum, kan-de-lā′brum.
Candia, kan′di-*a*.
Candon, käṅ-dôṅ′.
Canoa, kä-nā′ä.
Canella, ka-nel′*a*.
Canephori, ka-nef′ō-rī.
Canes Venatici, kā′nēz vē-nat′i-sī.
Cañete, kä-nyā′tā.
Cangas de Tineo, käng′gäs dā tē-nā′ō.
Canicatti, kä-nē-kät′tē.
Canidæ, kan′i-dē.
Canigou, kȧ-nē-go͞o′.
Canina, kä-nē′nä.
Canisius College, ka-nish′i-us.
Canis, kā′nis.
Canitz, kä′nits.
Cannabis, kan′*a*-bis.
Cannæ, kan′ē.
Cannes, kän.
Canniff, kan′if.
Cannizzaro, kän-nēt-tsä′rō.
Cannock, kan′uk.
Cannstatt, kän′shtät.
Cannula, kan′ū-l*a*.
Cano, kä′nō.
Canoán, kä-nō-än′.
Cañon, kan′yun; *Sp.* kä-nyōn′.
Canonsburg, kan′unz-bûrg.
Canopus, ka-nō′pus.
Canosa, kä-nō′sä.
Canossa, kä-nos′sä.
Canova, kä-nō′vä.
Canovas del Castillo, kä′nō-väs del käs-tēl′yō.
Canrobert, käṅ-rō-bâr′.
Canso, kan′sō.
Cantab, kan′tab.
Cantabile and Cantilena, kän-tä′bē-lā, kän-tē-lā′nä.
Cantabrian, kan-tā′bri-*a*n.
Cantabricum Mare, kan-tab′ri-kum mā′rē.
Cantacuzenus, kan-t*a*-kū-zē′nus.
Cantal, käṅ-tȧl′.
Cantarini, kän-tä-rē′nē.
Cantata, kän-tä′tä.
Cantemir, kän′tye-mēr′.
Canterbury, kan′t*e*r-ber-i.
Cantharides, kan-thar′i-dēz.
Cantho, kän′thō.
Cantilena, kän-tē-lā′nä.
Cantilever, kan′ti-lev-*e*r.
Canton, *U. S.* kan′tun; *China* kan-ton′.
Cantonment, kan′tun-ment.
Canton River, kan-ton′.
Cantor, kan′tor.
Cantu, kän-to͞o′.
Canuck, k*a*-nuk′.
Canusium, k*a*-nū′shi-um.
Canute, k*a*-nūt′.
Canzone, kän-tsō′nā.
Cao-Bang, kä′ō-bäng′.
Caoutchouc, ko͞o′cho͝ok *or* kou′cho͝ok.
Capaneus, k*a*-pā′nē-us.
Cape Agulhas, Blanco, ä-go͝ol′yäs, bläng′kō.
Cape Breton, brit′un *or* bret′un.
Capefigue, kȧp-fēg′.
Cape Girardeau, jē-rär-dō′.
Cape Haitien, hā′tē-en.
Capel, kap′el.
Capelin, kap′*e*-lin.
Capell, kā′pel.
Capella, k*a*-pel′*a*.
Capello, kä-pel′lō.
Capen, kā′pen.
Capercailzie, kap-*e*r-kāl′yi, *or* -zĭ, *or* kā-p*e*r-.
Capern, kā′p*e*rn.
Capernaum, k*a*-pûr′nā-um.
Cape Verde, vûrd.
Capias, kā′pi-as.
Capillaries, kap′i-lā-riz.
Capillarity, kap-i-lar′i-ti.
Capistrano, kä-pēs-trä′nō.
Capito, kä′pē-tō.
Cápiz, kä′pēth.
Capmany y Monpalau, de, dā käp-mä′nē ē mōn-pä-lä′o͝o.
Cap Martin, kȧp mär-taṅ′.
Capnomancy, kap′nō-man-si.
Capodistria, kä′pō-dēs′trē-ä.
Capo d'Istrias, kä′pō dēs′trē-äs.
Cappadocia, kap-*a*-dō′shi-ä.
Cappel, kä′pel.

Capponi, kăp-pō′nē.
Caprera, kä-prā′rä.
Capri, kä′prē.
Capriccio, kä-prēt′chō.
Caprivi de Caprara de Montecuculi, kä-prē′vē dā kä-prä′rä dā mōn-tā-kōō′kŏŏ-lē.
Caproic, ka-prō′ik.
Capron, kā′prun.
Capua, kap′ū-*a*; *It.* kä′-pŏŏ-ä.
Capuana, kä-pŏŏ-ä′nä.
Capuchin, kap-ū-shēn′.
Capybara, kä-pē-bä′rä.
Caraballos Occidentales, kä-rä-bäl′yōs ok-sē-den-tä′lās.
Caraballos Sur, sōōr.
Carabao, kä-rä-bä′ō.
Carabidæ, k*a*-räb′i-dē.
Carabiniers, kar-*a*-bi-nērz′.
Carabobo, kä-rä-bō′bō.
Caracal, kä-rä-käl′.
Caracalla, kar-*a*-kal′*a*.
Caracara, kä-rä-kä′rä.
Caracas, kä-rä′käs.
Caracci, kä-rät′chē.
Caracciolo, kä-rät′chō-lō
Caracoles, kä-rä-kō′lās.
Caractacus, ka-rak′t*a*-kus.
Caraffa, kä-rä′fä.
Caraman, kä-rä-män′.
Carambola, kar-*a*m-bō′l*a*.
Caran d'Ache, kȧ-räṅ′ däsh′.
Carapa, kar′*a*-p*a*.
Carapeguá, kä-rä-pā-gwä′.
Carat, kar′*a*t.
Carausius, ka-rô′shi-us.
Caravaca, kä-rä-vä′kä.
Caravaggio, kä-rä-väd′jō.
Caravansary, kar-*a*-van′s*a*-ri.
Carbonari, kär-bō-nä′rē.
Carbone, kär-bō′nā.
Carcagente, kär-kä-hān′tā.
Carcajou, kär′kä-jōō.
Carcano, kär-kä′nō.
Cárcar, kär′kär.
Carcassonne, kär-kȧ-sun′.
Carchemish, kär′ke-mish.
Carcinoma, kär-si-nō′m*a*.
Cardanus, kär-dā′nus.
Cardenal, kär-d′-nȧl′.
Cárdenas, kär′dā-näs.
Cardiff, kär′dif.
Cardigan, kär′di-g*a*n.
Cardiograph, kär′di-ō-grȧf.
Carditis, kär-dī′tis.
Cardoon, kär-dōōn′.
Cardross, kär′drôs.
Carducci, kär-dōōt′chē.
Carduchi, kär-dū′kī.
Carême, kȧ-rem′.
Carew, kā-rōō′ *or* kā′ri.
Carex, kā′reks.
Carey, kā′ri.
Cargill, kär′gil.
Carhart, kär′härt.
Caria, kā′ri-*a*.
Cariaco, kä-rē-ä′kō.
Cariama, sä-rē-ä′mä.
Caribbean, kar-i-bē′*a*n.
Caribbee Islands, kar′i-bē.
Caribou, kar′i-bōō.
Caribs, kar′ibz.
Caricature, kar′i-k*a*-tūr.
Caries, kā′ri-ēz.
Carigara, kä-rē-gä′rä.
Carijós, kä-rē-zhōs′.
Carillon, kar′i-lon; *Fr.* kȧ-rē-yôṅ′.
Carimata, kä-rē-mä′tä.
Carinatæ, kar-i-nā′tē.
Carini, kä-rē′nē.
Carinthia, ka-rin′thi-*a*.
Carinus, ka-rī′nus.
Carisbrooke, kar′is-brŏŏk.
Carissa, ka-ris′*a*.
Carissimi, kä-rēs′sē-mē.
Carit Etlar, kä′rit et′lär.
Carlaverock, kär-lav′*e*r-uk
Carlén, kär-lān′.
Carleton, kärl′tun.
Carli, kär′lē.
Carlisle, kär-līl′.
Carlos, kär′lōs.
Carlotta, or **Charlotte,** kär-lōt′tä; shär′lot; *Fr.* shär-lot′.
Carlovitz, kär′lō-vits.
Carlow, kär′lō.
Carlsbad, kärls′bät.
Carlson, kärl′son.
Carlstadt, kärl′shtät.
Carlyle, kär-līl′.
Carmagnola, kär-män-yō′-lä.
Carmagnole, kär-män-yōl′.
Carman, kär′m*a*n.
Carmarthen, kär-mär′TH*e*n.
Carmaux, kär-mō′.
Carmel, kär′mel.
Carmen Sylva, kär′men sil′v*a*.
Carmi, kär′mī.
Carmignano, kär-mēn-yä′-nō.
Carmina Burana, kär′mi-n*a* bū-rā′n*a*.
Carminatives, kär′mi-nā-tivz.
Carmona, kär-mō′n*a*.
Carnac, kär-nȧk′.
Carnarvon, kär-när′vun.
Carnassial, kär-nas′i-*a*l.
Carnauba, kär-nou′b*a*.
Carneades, kär-nē′*a*-dēz.
Carnedd Dafydd, kär-neTH′ dä-fiTH′.
Carnegie, kär-neg′i.
Carnic Alps, kär′nik.
Carniola, kär-ni-ō′l*a*.
Carnivora, kär-niv′ō-r*a*.
Carnochan, kär′nok-*a*n.
Carnot, kär-nō′.
Carnuntum, kär-nun′tum.
Carnutes, kär-nū′tēz.
Caro, *tn. U. S.*, kar′ō; *Ital.* kä′rō; *Fr.* kȧ-rō′.
Carob, kar′ub.
Carol, kar′ul.
Carolina, kar-ō-lī′n*a*.
Caroline, kar′ō-līn.
Carolings, kar′ō-lingz.
Carolus, kar′ō-lus.
Carolus-Duran, kar′ō-lus-dū-räṅ′.
Carotid, ka-rot′id.
Carpaccio, kär-pät′chō.
Carpathians, kär-pā′thi-*a*nz.
Carpeaux, kär-pō′.
Carpentaria, kär-pen-târ′-i-*a*.
Carpentras, kär-päṅ-träs′.
Carpi, kär′pē.
Carpocrates, kär-pok′r*a*-tēz.
Carpophore, kär′pō-fōr.
Carquinez, kär-kē′nās.
Carracci, kär-rät′chē.
Carrageen, kar′*a*-gēn.
Carrara, kär-rä′rä.
Carrel, kä-rel′.
Carreño, kär-rān′yō.
Carrer, kär-râr′.
Carrera, kär-rā′rä.
Carrhæ, kar′ē.
Carrick Pursuivant, kar′-ik pûr′swi-vant.
Carrier, *French pr.* kär-yā′.
Carrière, kär-yâr′.
Carriere, kär′yâr.
Carrizal Bajo, kä-rē-säl′ bä′hō.
Carroccio, kär-rot′chō.
Carron, kar′un.
Carronade, kar-un-ād′.
Carruthers, k*a*-rōōTH′*e*rz *or* k*a*-ruTH′*e*rz.
Carstares, kär′stârz.
Carstens, kär′stens.
Cartagena, kär-t*a*-jē′n*a*; *Sp.* kär-tä-hā′nä.
Cartago, kär-tä′gō.
Carte, kärt.
Cartel, kär-tel′.
Carteret, kär′t*e*r-et.
Cartesians, kär-tē′zh*a*nz.
Carthage, kär′thij.
Carthagena, kär-th*a*-jē′-n*a*; *Sp.* kär-tä-hā′nä.
Carthago Nova, kär-thā′-gō nō′vä.
Carthamin, kär′th*a*-min.
Carthusians, kär-thū′zh*a*nz.
Cartier, kär-tyā′.
Cartography, kär-tog′r*a*-fi.
Carton, kär′ton.
Cartoon, kär-tōōn′.
Cartouch, kär-tōōch′.
Cartouche, kär-tōōsh′.
Carucate, kar′ū-kāt.
Carúpano, kä-rōō′pä-nō.
Carus, kā′rus; *Ger.* kä′-rŏŏs.
Caruthersville, k*a*-rōōTH′-*e*rz-vil.
Carvajal, kär-vä-häl′.
Carvel, kär′vel.
Caryatides, kar-i-at′i-dēz.
Caryocar, ka-rī′ō-kär.
Caryophyllaceæ, kar-i-ō-fi-lā′sē-ē.
Caryota, kar-i-ō′t*a*.
Casa, kä′sä.
Casaba, kä′sä-bä.
Casabianca, kä-zä-bi-äng′-kä.
Casa Blanca, kä′sä bläng′-kä.
Casa Grande, grän′dā.
Casale, kä-sä′lā.
Casamance, kȧ-sȧ-mäṅs′.
Casanova, kä-sä-nō′vä.
Casas Grandes, kä′säs grän′dās.
Casati, kä-sä′tē.
Casaubon, ka-sô′bun; *Fr.* kä-zō-bôṅ′.
Cascara, kȧs′k*a*-r*a*.
Cascarilla, kas-k*a*-ril′*a*.
Cascina, kä′shē-nä.
Caseation, kā-sē-ā′shun.
Caseine, kā′sē-in.
Casentino, kä-sen-tē′nō.
Caserta, kä-ser′tä.
Cashel, kash′el.
Cashew Nut, k*a*-shōō′.
Cashgar, käsh-gär′.
Cashibos, kä-shē′bōs.
Cashmere, kash-mēr′.
Casigurán, kā-sē-gōō-rän′.
Casimir-Périer, kä-zē-mēr′pā-ryā′.
Casino, k*a*-sē′nō.
Caslon, kas′lun.
Casoria, ka-sō′ri-*a*.
Caspari, käs′pä-rē.
Caspe, käs′pā.
Caspian Sea, kas′pi-*a*n.
Cassaba, käs′sä-bä.
Cassagnac, kä-sȧ-nyȧk′.
Cassander, ka-san′d*e*r.
Cassava, kas′*a*-v*a*.
Cassel, käs′*e*l.
Cassell, kas′el.
Cassia, kash′*a* *or* kas′i-*a*.
Cassianus, kas-i-ā′nus.
Cassin, kȧ-saṅ′.
Cassini, käs-sē′nē.
Cassino, kȧ-sē′nō.
Cassiodorus, kas-i-ō-dō′-rus.
Cassiopeia, kas-i-ō-pē′y*a*.
Cassiques, kä-sēks′.
Cassiquiare, käs-sē-kē-ä′rā.
Cassiterides, kas-i-ter′i-dēz.
Cassiterite, ka-sit′*e*r-īt.
Cassius, *Lat.* kash′i-us; *Ger.* kä′si-ŏŏs.

Cassivelaunus, kas-i-ve-lō′nus.

Cassowary, kas′ō-wā-ri.

Castaldi, käs-täl′dē.

Castalia, kas-tā′li-*a*.

Castaños, käs-tä′nyōs.

Castelar, käs-te-lär′.

Castelbuono, käs-tel-bwô′nō.

Castelfranco, käs-tel-fräng′kō.

Castel Gandolfo, gän-dol′fō.

Castellammare, käs-tel-läm-mä′rā.

Castellana, käs-tel-lä′nä.

Castellanos, käs-tel-yä′nōs.

Castellón, käs-tel-yōn′.

Castel San Pietro, käs-tel′ sän pyā′trō.

Casteltermini, -ter′mē-nē.

Castelvetrano, -vā-trä′nō.

Casti, käs′tē.

Castiglione, käs-tēl-yō′nā.

Castile, kas-tēl′.

Castilho, käs-tēl′yō.

Castilla, käs-tēl′yä.

Castillejo, käs-tēl-yā′hō.

Castine, kȧs-tēn′.

Castlemaine, kȧs′′l-mān.

Castlereagh, kȧs-′l-rā′.

Cas′tra Bon-nen′si-a.

Castrén, käs-trān′.

Castres, käs′tr′.

Castries, käs-trē′.

Castriot, kas′tri-ot.

Castro, käs′trō.

Castro del Rio, del rē′ō.

Castrogiovanni, kās-trō-jō-vän′nē.

Castro-Urdiales, o͞or-dē-ä′lās.

Castro y Bellvis, ē bel′vēs.

Castruccio-Castracani, käs-tro͞o′chō-käs-trä-kä′nē.

Castua, käs′to͞o-ä.

Casuarina, kazh-ū-*a*-rī′n*a*.

Ca′sus Bel′li.

Caswell, kaz′wel.

Catacombs, kat′*a*-kōmz.

Catalan, kat′*a*-lan.

Catalani, kä-tä-lä′nē.

Catalaunian, kat-*a*-lô′ni-*a*n.

Catalonia, kat-*a*-lō′ni-*a*.

Catalpa, k*a*-tal′p*a*.

Catalysis, k*a*-tal′i-sis.

Catamaran, kat′*a*-m*a*-ran′.

Catamarca, kä-tä-mär′kä.

Catanduanes, kä-tän-dwä′nās.

Catania, kä-tä′nē-ä.

Catanzaro, kä-tän-dzä′rō.

Catarmán, kä-tär-män′.

Catasauqua, kat-*a*-sô′kw*a*.

Catawissa, kat-a-wis′*a*.

Catbalogan, kät-bä-lō-gän′.

Cateau-Cambrésis, kȧ-tō′-käń-brā-zē′.

Catechu, kat′i-kū *or* -chū.

Catechumen, kat-i-kū′men.

Catena, ka-tē′n*a*.

Catenary, kat′i-nā-ri.

Cathari, kath′*a*-rī.

Cathay, ka-thā′.

Catherine, kath′*e*r-in.

Catherwood, kath′*e*r-wo͝od.

Cathether, kath′i-t*e*r.

Cathion and Cathode, kath′i-on, kath′ōd.

Catholicus, k*a*-thol′i-kus.

Catiline, kat′i-līn.

Cato, kā′tō.

Catoche, kä-tō′chā.

Catoptrics, kat-op′triks.

Catorce, kä-tôr′thā.

Cato Street, kā′tō.

Cattaro, kät′tä-rō.

Cattegat, kat′i-gat.

Cattell, ka-tel′.

Cattermole, kat′*e*r-mōl.

Catti, kat′ī.

Cattleya, kat′li-*a* *or* kat-lī′*a*.

Catullus, k*a*-tul′us.

Catulus, kat′ū-lus.

Catumbella, kä-to͞om-bel′lä.

Cauca, kou′kä.

Caucasus, kô′k*a*-sus.

Cauchy, kō-shē′.

Cauda-galli, kô′d*a*-gal′ī.

Caudium, kô′di-um.

Caulaincourt, kō-lań-ko͞or′.

Caulopteris, kô-lop′t*e*r-is.

Cauquénes, kou-kā′nās.

Caura, kou′rä.

Caus, Caux, Caulx, kō.

Causalgia, kôz-al′ji-*a*.

Causerie, kōz-rē′ *or* kōz′-rē.

Causses, kōs.

Cautín, kou-tēn′.

Cautio, kô′shi-ō.

Cauto River, kou′tō.

Cauvery, kô′v*e*r-i.

Cavadei Tirreni, kä′vä-dā′ē tĕr-rā′nē.

Cavaignac, kȧ-vā-nyȧk′.

Cavaillon, kȧ-vā-yôń′.

Cavalcanti, kä-väl-kän′tē.

Cavalcaselle, kä-väl-kä-sel′lā.

Cavalla, kä-väl′lä.

Cavalotti, kä-vä-lot′tē.

Cavan, kav′*a*n.

Cavatina, kä-vä-tē′nä.

Caveat, kā′vi-at.

Caveat Emptor, emp′tor.

Cavedone, kā-vā-dō′nā.

Caven, kā′ven.

Cavendish, kav′en-dish *or* kan′dish.

Caviare, kav-i-är′ *or* kȧ-vyär′.

Cavité, kä-vē-tā′.

Cavour, kä-vo͞or′.

Cawdor, kô′dor.

Cawnpur, kôn′po͝or.

Caxamarca, kä-hä-mär′kä.

Caxiás, kä-shē-äsh′.

Cayambe, kī-äm′bā *or* kī-äm-bā′.

Cayenne, kā-en′ *or* kī-en′.

Cayes, aux, ō kā′.

Caylus, kā-lüs′.

Cayman, kā′m*a*n.

Caymans, kī-mänz′.

Cayor, kī-ōr′.

Cayster, kā-is′t*e*r.

Cayuga, kā-yo͞o′g*a*.

Cayvan, ka-van′.

Cazin, kȧ-zań′.

Ceadda, ke-äd′dä.

Cean-Bermudez, thā′än-ber-mo͞o′dāth.

Ceará, sā-ä-rä′.

Ceará Mirim, mē-rēń′.

Cebes, sē′bēz.

Cebidae, seb′i-dē.

Cebú, sā-bo͞o′; *Span. pron.* thā-vo͞o′.

Cecchi, chek′kē.

Cech, che*ch*.

Cecidomyia, ses-i-dō-mī′i-*a*.

Cecil, ses′il *or* sis′il.

Cecilia, sē-sil′i-*a*.

Cecropia, sē-krō′pi-*a*.

Cecrops, sē′krops.

Cedula, sed′ū-l*a*; *Span. pron.* thā′do͞o-lä.

Cefalu, chā-fä-lo͞o′.

Ceglie, chāl′yā.

Cehegin, thā-ā-hēn′.

Celakovsky, chel′ȧ-kof-skē.

Celandine, sel′*a*n-dīn *or* -din.

Celano, chā-lä′nō.

Celaya, sā-lä′yä.

Celebes, sel′*e*-bēz.

Céleste, sā-lest′.

Celestina, *Span. pron.* thā-les-tē′nä.

Celestine (*Pope*), sel′es-tīn *or* -tin; *min.*, -tin.

Celestines, sel′es-tinz *or* sē-les′tinz.

Celestite, sel′es-tīt.

Celibacy, sel′i-b*a*-si *or* sē-lib′*a*-si.

Celina, sē-lī′n*a*.

Cellarius, tsel-ä′ri-o͝os.

Celle, tsel′*e*.

Cellini, chel-lē′nē.

’Cello, chel′ō.

Cellulitis, sel-ū-lī′tis.

Celluloid, sel′ū-loid.

Cellulose, sel′ū-lōs.

Celosia, sel-ō′si-*a* *or* -shi-*a*.

Celsius, sel′si-us *or* -shi-us.

Celsus, sel′sus.

Celtiberi, sel-ti-bē′rī.

Cenci, chen′chē.

Ceneda, chā′nā-dä.

Cenis, Mont, môń s*e*-nē′.

Cenobites, sen′ō-bīts *or* sē′nō-.

Cenomanni, sen-ō-man′ī *or* sen-ō-mä′nē.

Cenotaph, sen′ō-tȧf.

Centaurea, sen-tô-rē′*a* *or* sen-tô′ri-*a*.

Centauri, sen-tô′rē.

Centaurus, sen-tô′rus.

Centimeter, sen′ti-mē-t*e*r.

Centlivre, sent-liv′*e*r *or* -lē′v*e*r.

Cento, chen′tō.

Centralia, sen-trā′li-*a*.

Centre, *F. pron.* säń′tr′.

Centrifugal, sen-trif′ū-g*a*l.

Centripetal, sen-trip′i-t*a*l.

Centumviri, sen-tum′vi-rī.

Centuripe, Centorbe, chen-to͞o′rē-pā, chen-tôr′bā.

Ceorl, keôrl *or* cherl.

Ceos, sē′os.

Cephalaspis, sef-*a*-las′pis.

Cephalhaematoma, sef′*a*l-hē-m*a*-tō′m*a*.

Cephalochorda, sef′*a*-lō-kôr′d*a*.

Cephalodynia, sef′*a*-lō-din′i-*a*.

Cephaloedium, sef-*a*-lē′di-um.

Cephalonia, sef-*a*-lō′ni-*a*.

Cephalopoda, sef-a-lop′ō-d*a* *or* sef′*a*-lō-pō′d*a*.

Cepheus, sē′fūs.

Cephissus, sē-fis′us.

Ceram, se-räń′

Ceramics, sē-ram′iks; kē-, *when written with k.*

Cerargyrite, sē-rär′ji-rīt.

Cerastes, sē-ras′tēz.

Cerasus, ser′*a*-sus.

Ceratodus, ser-a-tō′dus.

Ceraunii, sē-rô′ni-ī.

Cerberus, sûr′b*e*r-us.

Cercaria, sûr-kā′ri-*a*.

Cercyon, sûr′si-on.

Cerdic, kûr′dik *or* sûr′dik.

Cerebritis, ser-i-brī′tis.

Cerebrum, ser′i-brum.

Ceres, sē′rēz.

Cereus, sē′rūs *or* sē′rē us.

Cerignola, chā-rē-nyō′lä.

Cerigo, cher′ē-gō.

Cerithium, se-rith′i-um.

Cerium, sē′ri-um.

Cerro de Pasco, ser′rō dā päs′kō.

Cerro Gordo, gôr′dō.

Cerro Largo, lär′gō.

Certaldo, cher-täl′dō.

Certiorari, sûr′shi-ō-rā′rī.

Certosa di Pavia, cher-tō′zä dē pä′vē-ä.

Cerumen, sē-ro͞o′men.

Cervantes-Saavedra, ther-vän′tās sä′ä-vā′drä.

Cervera y Topete, ther-vā'rä ē tō-pā'tā.

Cervetri, cher-vā'trē.

Cervidae, sûr'vi-dē.

Cervin, ser-vaṅ'.

Cesalpini, chā-zäl-pē'nē.

Cesarewitch, sē-zär'e-vich.

Cesari, chā'zä-rē.

Cesarotti, chā'zä-rot'tē.

Cesena, chā-zā'nä.

Cesnola, di, dē ches-nō'lä.

Céspedes, thes'pe-dās.

Céspedes y Borgas, ē bôr'gäs.

Cessio Bonorum, sesh'i-ō bō-nō'rum.

Ces-to'da.

Cestracion, ses-trā'shi-on *or*-si-on.

Cestui que Trust, ses'twē k*e* trust.

Ces'tum Ven'e-ris.

Cetacea, se-tā'shi-*a*.

Ceteosaurus, sē'ti-ō-sô'rus.

Cetinje, chet'ēn-yā.

Cetotolites, sē-tot'ō-līts.

Cette, set.

Cettinje, chet'ēn-yā.

Cetus, sē'tus.

Cetywayo, ketch-wä'yō.

Ceuta, sū'*ta*; *Span. pron.* thā'o͞o-tä.

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